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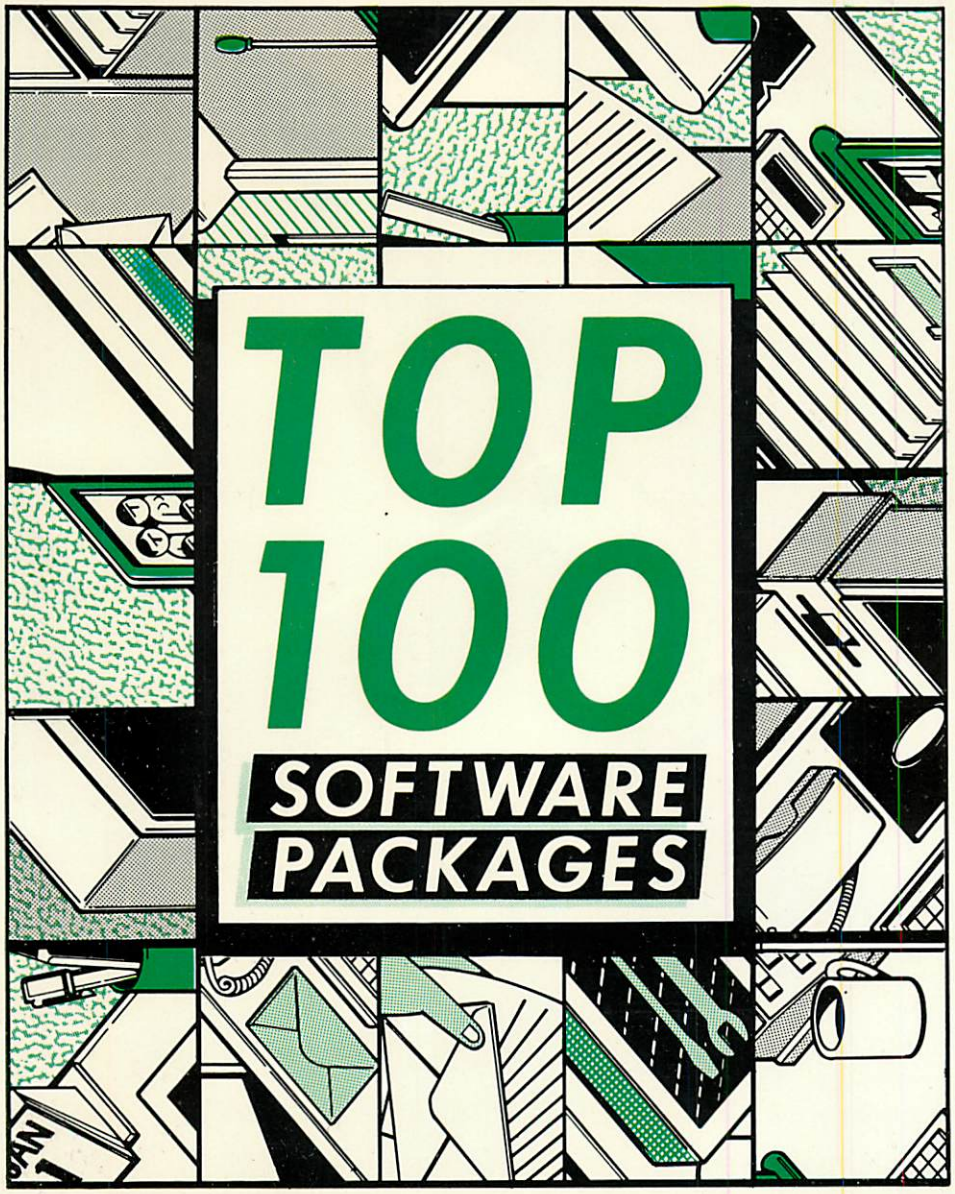

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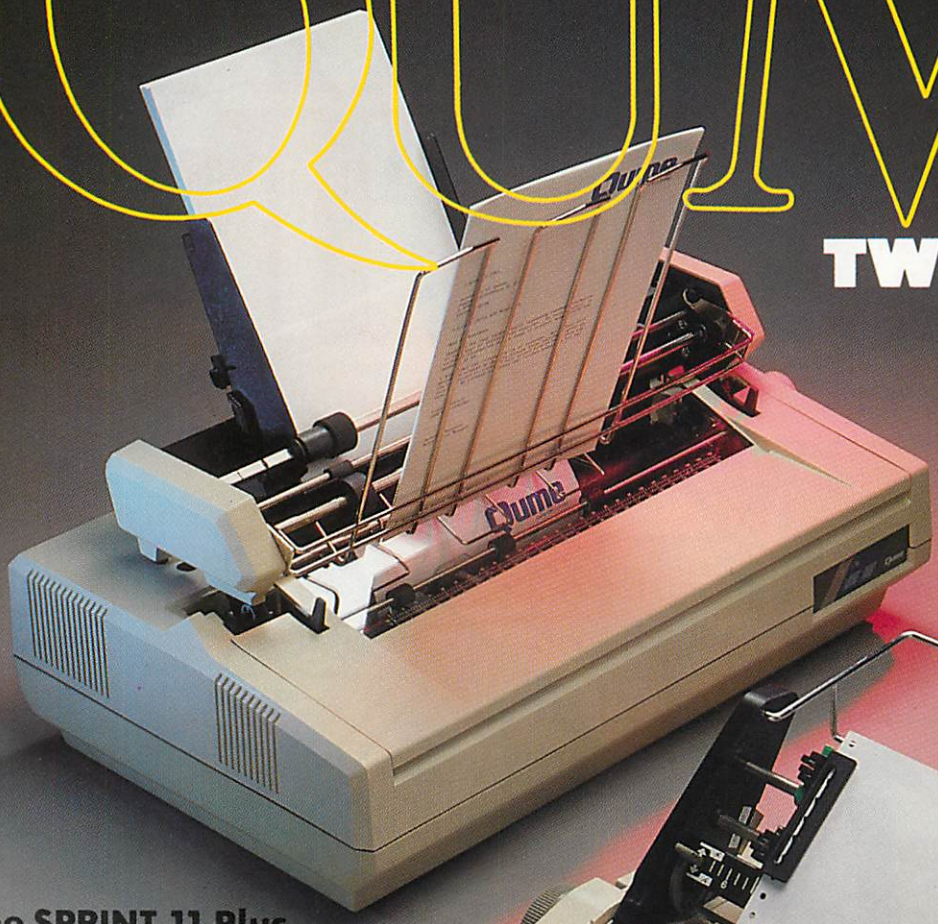

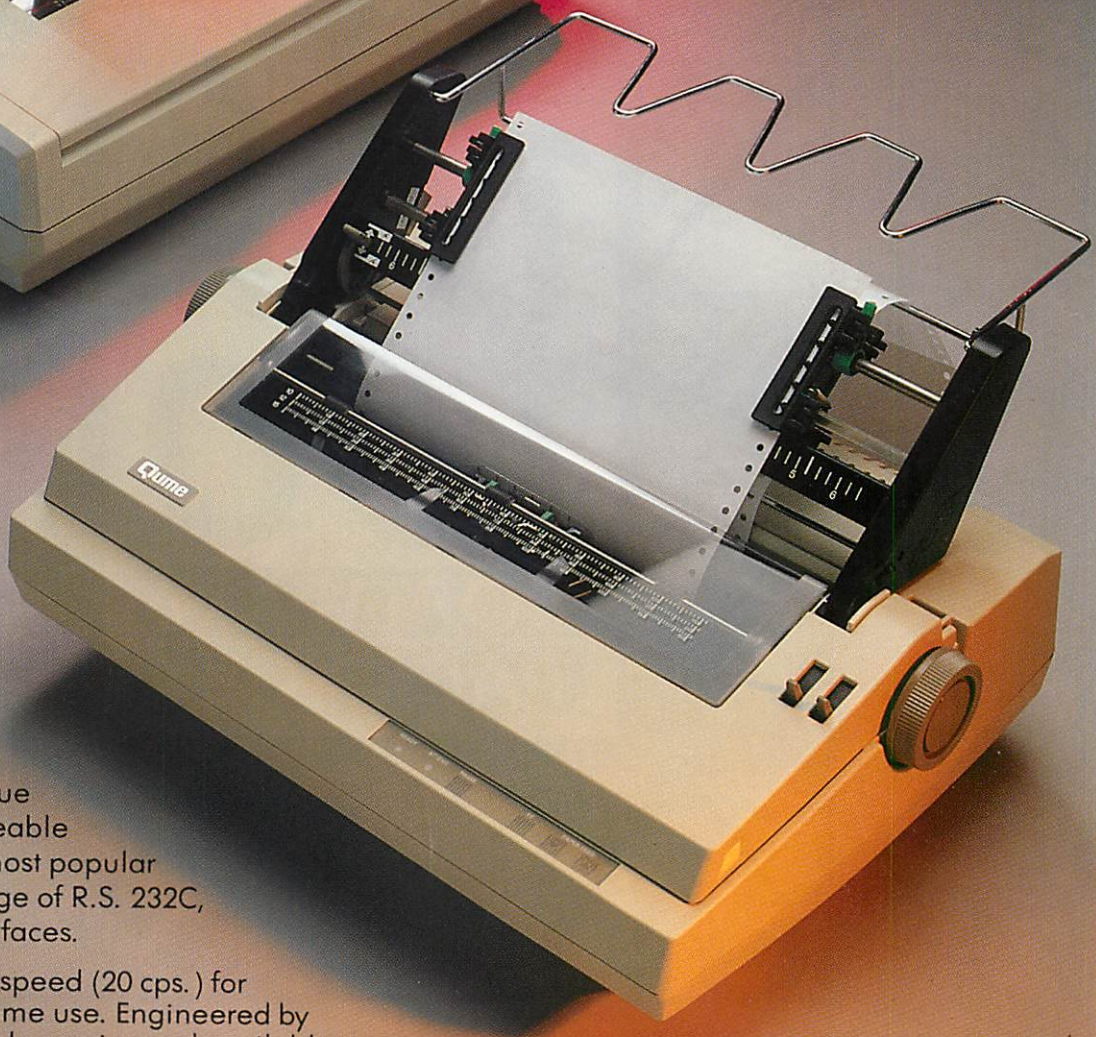

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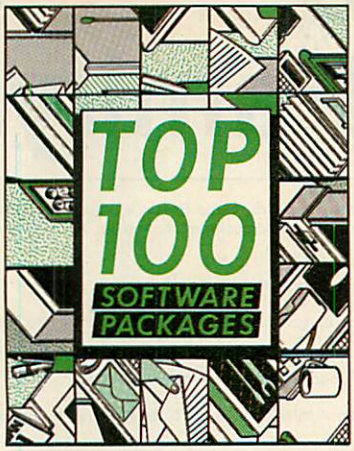
JANUARY 1986 **CONTENTS**

COVER FEATURE



TOP 100 SOFTWARE PACKAGES

Our special feature looks at the rapidly expanding world of business programs. *Ian Stobie* presents 100 of the best packages in their respective areas, and examines some of the general issues like copy protection which affect them all. To aid prospective purchasers of professional software, we have divided the field into 10 principal categories: Words, Data, Numbers, All-in-Ones, Graphics, Comms, Utilities, Project Planners, Software Families and Environments 87

INSIDE

Apricot Xen Still going it alone — page 56.

ISI Worm disc Exclusive review — page 64.

APRICOT XEN

Glyn Moody looks at Apricot's answer to the IBM PC/AT, and is very impressed but slightly concerned **56**

ACORN COMMUNICATOR

The long-awaited new machine from Acorn. *Roger Cullis* provides an in-depth report on this exciting work station with built-in comms **61**

ISI-525 WORM DRIVE

The write once, read many times optical-disc drive has arrived. *Glyn Moody* looks at a 100Mbyte unit for micros **64**

OLIVETTI M-24SP

Who needs an AT? asks *Jack Schofield*, when you can have Olivetti's turbocharged update of its already powerful M-24 machine **67**

BROTHER TWINRITER

A printer which gives you a daisywheel and a dot-matrix in the same machine **69**

LOTUS REPORT WRITER

If you run Lotus 1-2-3 or Symphony, Report Writer lets you extract data from spreadsheets and format it neatly **70**

PERSONAL PUBLISHING

Bill Bennett tries out two packages which enable the Macintosh to produce professional-quality layouts with text and images **72**

PROJECT PLANNERS

A new software category has sprung up for project management. *Richard Sarson* looks at some of the leading packages **76**

TOTAL MUSIC

Glyn Moody tries out an upmarket Midi sequencer and music transcription program **79**

TOP 10 LAP PORTABLES

A4-sized machines now offer serious computing power as well as true portability **81**

INDEX 1984-1985

A comprehensive index to the last two years of Practical Computing **119**

NEWS

HARDWARE NEWS
Torch Triple X **13**

IBM NEWS
Cut-price clones **15**

Tandon Computer's AT-emulator.

SOFTWARE NEWS
Gem developments **19**

COMPEC NEWS
Acorn and the rest **21**

FT CONFERENCE
IBM rules OK? **22**

GENERAL NEWS
The micro market surveyed **25**

OPEN FILE

CONTENTS
This month's programs **101**

BBC WP
Handling mathematical formulae **103**

REPORT GENERATION
Prose output from questionnaires **109**

APPLE
Converting to upper case **115**

COMMODORE
Control codes conversion **117**

REGULARS

EDITORIAL
Happy New Year? **5**

FEEDBACK
Your letters **7**

SOFTWARE WORKSHOP
Taking the Mickey **29**

COMMS
Prestel update **33**

NEXT MONTH
What's in store **35**

THE LEVY SERIES
More words **37**

ASK PC
You ask, we answer **41**

BOOKS
QL collection **46**

INTERVIEW
Chuck Peddle **85**

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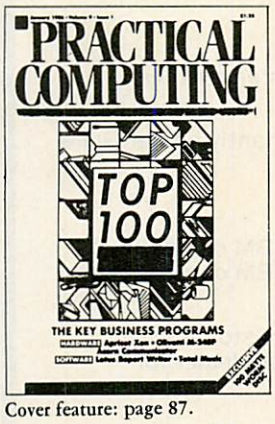

Cover feature: page 87.

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HAPPY NEW YEAR?

Don't be misled by all the yelps we have been hearing of late from U.S. manufacturers. Here in the U.K. 1986 could well be a very good year for business micros. We are told that when the U.S. sneezes, Europe catches a cold. Yet in spite of Uncle Sam's worsening bout of computer flu, two independent market surveys have predicted that next year should see the march of micros into U.K. and continental businesses continue with barely a break of step.

This is cold comfort to the British manufacturers who have already hit hard times and gone under. And even in America there are very few companies in a position to launch new products for 1986. Many have already shot their bolt, even if the product in question was launched — initially at least — well back in 1985.

Commodore's Amiga and Atari's 520ST spring to mind. All that these companies can do for 1986, apart from a few marketing tweaks, is to keep their fingers crossed, sit back and hope. The fate of these two products will be largely determined by which way the software houses jump, and whether the public buys in sufficient quantities. Similarly, Apricot has already launched its bid for success in 1986 in the shape of the Xen. By definition, IBMulators are incapable of doing anything spectacular since conforming to an accepted standard is what they are all about.

This leaves three main players in the U.K. micro market who could make life interesting next year, plus a more nebulous Rest of the World contingent. The first candidate, of course, is IBM. Rumours of the PC-2 have been rife in 1985, along with tales about a battery-portable product, codenamed Clamshell. In a sensible world, IBM would launch both as soon as possible. In a perfect world, they would have 3.5in. discs, thus dragging business storage into the 1980s at last. Whatever the difficulties such a launch would entail for the software world and IBM's dealers in having to cope with two incompatible disc formats, to reach maturity it is a transition which must be undergone one day, so it may as well be now.

Apple, too, has some growing up to do in 1986. It began life well by putting the personal into personal computing and establishing itself as the archetypal Mr Nice with its open architecture Apple II. More recently, Apple seems to have decided that having become a billion dollar company be being nice, it could become a multi-billion dollar corporation by getting tough. Hence the launch of the Macintosh. Its closed architecture precluded the third-party add-ons which helped rocket the Apple II to fame and fortune, and has proved one of the biggest hindrances to its success.

Recently the Chief Executive Officer at Apple, John Sculley, indulged in some timely public breast beating — mainly for the benefit of a group of influential stockbroker analysts. He announced that open architecture versions of the Macintosh are on the stocks, which is good news for Apple and good news for Macintosh users. Now all Apple has to do is to stop bullying companies like Digital Research over Gem, and it might regain its place in the hearts of the micro community, and capture more places on the corporate desk tops.

Another company which could improve the quality of micro life is ICL. In the past this magazine may have seemed unduly harsh about some of ICL's previous efforts. This is simply a matter of chiding a favourite son or daughter: we would dearly love to see great things of this company, but are still waiting.

One promising sign is that it seems to acknowledge the importance of micros. It even has one product which is innovative, and almost a world-beater, the One Per Desk. As well as building on the initial successes it has had with this machine, it would do well to swallow its corporate pride and get in there with a fast AT-alike.

Apart from these three, there remains the Rest of the World we tend to overlook. These are the nobodies who will come from nowhere, with a product expected by no one. They will take the market by the horns and shake it something awful. These are the future Apples and Compaqs. They are why microcomputing is never dull, and why 1986 could well be a very good year, even if — as is only too likely — the big names fail to make it one.

5 YEARS AGO...

Desk-top and personal computers are finding their way into the business and professional community, with their original markets in science education and the home sliding into second place according to a study of the European market by the International Data Corporation of London.

Last year 78,000 desk-top computers were shipped in Western Europe, with 52 percent going into the business sector. By 1983, total shipments are expected to reach 425,000 with 64 percent going to the business community.

IDC claims that Britain has the most developed market in Western Europe due largely to the concentration of efforts by the major U.S. vendors.

The main advantage that Britain has is the availability of software packages and the dealer/distributor network, although business users still complain of having to re-write substantial sections of programs to run them properly.

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FEEDBACK

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make suggestions, which we are always happy to receive. Make sure you use Feedback — it is your chance to keep in touch. Write to

Feedback, Practical Computing,
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Sutton, Surrey SM2 5AS

Freeware

SINCE writing my article for the December issue I've received PC-Write version 2.55, which adds options including mailmerge, mouse support, on-screen symbols and colours to show embedded printer commands, word counting, user-defined keys, an end-of-line bell, and a menu-based printer driver generator. Documentation is now 186 pages, Help is now eight screens long, and many of the commands now resemble those used by WordStar. The price is now $12 for a program disc and full registration is still $75.

It is a little more intimidating than the early version, but still easy to learn and use. PC-Write isn't compatible with Apricot, DEC Rainbow, Tandy 2000, and a few other machines, so try the early version available in the U.K. before sending off to the U.S. for the current version.

By default I seem to have suggested that Wordflex has a word-counter command; this is not the case, and subsequent experience has shown that this program is even less user-friendly than described.

Spectronics supply CP/M as well as MS-DOS software, and can copy MS-DOS programs to Apricot discs for £5 per disc. All the libraries include a vast range of software, notably databases, spreadsheets and utilities. The article reflects my own interests, as a freelance author, rather than a representative selection of all the software available.

MARCUS L ROWLAND,
London W2.

Mallard Basic

I HAVE just read the review of the Amstrad PCW-8256 and of Locoscript in your November issue. We are glad that you liked it.

Locomotive Software's Mallard-80 is the Basic bundled with the PCW-8256. We also have available Mallard-86 and Multi-user Mallard-86. Mallard-86 is the 16-bit version which runs on IBM PCs, Apricots, etc., under either DOS or CP/M, and the multi-user version runs on the same machines under Concurrent CP/M. All versions use the same dialect of Basic, so if you obey the multi-user rules, programs will run unchanged in all operating environments. Our multi-user Mallard Basic already has a number of satisfied customers.

In your October issue you printed a letter from Noel Mawer. The letter referred to a table of Bagshaw Benchmark results, which you also published. Unfortunately, the letter said Mallard was slower than Microsoft whereas the table said Mallard was faster.

We believe Mallard to generally be 30 percent faster than Microsoft, but this of course varies with the particular test. Some tests of disc-based activities when running under Mallard Basic rely heavily on operating-system buffering, but under Microsoft the buffering is handled by the interpreter. It is possible that if the letter was right and the table incorrectly transcribed, Mr Mawer was actually comparing the defaults of his Comart XIOS buffers with Microsoft's buffering. We would like to check this, but cannot find the Benchmarks on the TBBS bulletin board. If the table was right, we'd like to correct the slight on Mallard's agility.

I note a small item in your November issue on the Microscribe 600. This comes with a specially developed version of Mallard-80 which includes communications and graphics extensions. The Microscribe clocks in with a Basic Benchmark average of under 9 — about twice as fast as the IBM PC. Note that this is faster than the figure given at the Microscribe launch as the machine now runs faster.

HOWARD FISHER,
Locomotive Software Ltd,
Dorking,
Surrey.

ANTI-STATIC PROTECTION

I MISSED the *Tomorrow's World* programme about ESD, but its effects are very real and damaging.

I point out that Inmac already provide earthing mats and straps of various sorts and sizes, the smaller of which are suitable for PC users.

Also a Scandinavian company has recently advertised a roll-up conductive rubberised plastic mat to place under the keyboard for this purpose, in one of the popular magazines. It was relatively expensive, but of course the material for this sort of plastic is expensive to produce.

I solved the problem in a much cheaper way. I made a mat from a sheet of thin card covered on both sides with one continuous piece of aluminium kitchen foil, the edges reinforced with strips of Sellotape to guard against wear and tear. The earth connection is by a common paper clip with a wire soldered to it, Sellotaped in place. The mat is big enough to have an apron which extends 2in. in front of the keyboard so as to ensure easy earthing for my fingers and wrists.

It also acts as an effective screen for the RF radiation, produced by the CPU, between the keyboard and the drives and cassette unit on the shelf below.

LARRY MASCALL,
Thornbury,
Bristol.

Software for the mentally handicapped

WE HAVE recently obtained a grant to produce computer software for mentally handicapped people which will be the subject of a three-year project at the University of Keele. We have just finished our first two pieces of software including the first ever computer arcade game aimed at mentally handicapped people, Mr Ugh. We would be very interested to hear from anyone who has a similar interest or who would like to receive a copy of our free bulletin which is produced at regular intervals.

ROB COLLINS,
Department of Psychology,
University of Keele,
Staffordshire.

Priority decision making

"VERY useful in the right hands" your reviewer commented on the Priority Decision System (PDS), the Budget Priority System (BPS), and the Work Priority System (WPS) in November's *Practical Computing*. But whose are "the right hands"?

Despite media publicity of committee use of the systems, they were designed for and with middle and senior managers and their advisors in many industries or businesses. These are currently the primary users, whether as teams or, more usually, individuals.

Our research, which managers confirm for themselves with the system, demonstrates that most managers' decisions are probably inconsistent, and their objectives contradict their priorities, which in turn contradicts their allocations of resources. This underlines how relevant such systems are for effective operational decision-making resource allocation, and evaluation — not simply as "interesting" tools for testing or developing one's management skills.

Though the systems cannot produce inspired solutions to problems, they do question any illogicalities in a way which leads to sharper thinking and then produce solutions logically developed from users' reasoned views. Contrary to the reviewer's suggestions, the PDS techniques for decision-making and priority-setting — appropriate for anyone with a difficult decision to take — are quite different from the resource allocation and evaluation techniques used in BPS and WPS — appropriate for anyone with work or money to allocate.

Users of the systems confirm they do not need any of the documentation to use the program successfully, or occasionally, just the short and simple Quick Run Through. More comprehensive

(continued on next page)

(continued from previous page)
documentation is also supplied and this too is being simplified as users interested in the many special applications of the systems requested. It shows, for example, how BPS can be effectively used when the total amount to be spent is not known, contrary to the reviewer's implication.

J ALGIE AND W FOSTER,
Work Sciences Associates and Brunel University Management Decision Programme,
London N6.

WHATEVER makes your reviewer think that the Priority Decision System, which he regards as "a boon as a decision-making aid for committees", isn't just as important for the manager?

V HARCOURT,
Penta-Daxo Associates,
London W1.

Electric Software ROM

UNDER the PCW Show News section in the November issue, a mention was made of the ROM softcard for the MSX. However it was twice stated that the softcard was marketed by Electric Dreams rather than Electric Software Ltd. Electric Dreams being a competitor of ours we feel it only right this matter be put right. Electric Software are the sole U.K. distributor of the Softcard, not Electric Dreams.

J A MILLER,
Electric Software Ltd,
Cambridge.

Mass storage

I WAS surprised that the article on floppy-format exchange software in your October issue did not include any mention of my own product Alldisc. This is available at £150 excluding VAT to run on any CP/M computer with an 80-bus floppy-disc controller such as Geminy Galaxy/Multi-board, Nascom 1/2/3, Map-80, and will enable interchanges between 8in., 5.25in. and 3.5in. formats.

Complete systems which will also double as an office or laboratory computer can be supplied from about £1,850, excluding VAT, for 5.25in. only, with 8in. or 3.5in. drives added as required. A version for UCSD p-System formats is also available.

MIKE YORK,
Microcomputer Services,
9 Rosehill Road,
London SW18 2NY.

Hotline help

JOIA SHILLINGFORD is to be congratulated on the excellent article on computer hotlines advising buyers to test the temperature of the hotline before purchasing the product — see *PC* August, page 75. However, the article refers only to hotlines provided by computer companies, either directly or through their authorised dealers, as part of the service rightly expected of such suppliers.

At present there is a large and growing body of users who are tempted to buy in the cheapest possible market where massive discounts do not permit any kind of hotline support. Some such buyers are prepared to work out their own solutions to problems as they arrive, others are completely unaware that any degree of expertise is required to get the most from their microcomputers or indeed to get them to work at all.

For the benefit of such users Interlex has introduced Telehelp, an independent hotline support service manned by teams of helpers trained and equipped to support a growing range of hardware and software products.

J RICHARD LANE,
Interlex,
Kingston upon Thames,
Surrey.

Fleet Street on file

WITH reference to the letter in Ask PC in the October edition from Victor Blackman and titled "Outgrowing the BBC Micro".

I thought the reply was on totally the wrong tack. Heavens, are the contributors of *PC* so tied up in micros, etc., that they did not recognise the name of the one and only Victor Blackman — Fleet Street photographer extraordinaire and the wittiest contributor to *Amateur Photographer* it has been my pleasure to read. Take pity on the man; he probably hasn't thousands of negatives to file, but tens of thousands! What he needs is not so much a larger computer as a Cray! Shall we start passing the hat round now?

ALAN E SEPHTON,
Henfield,
West Sussex.

Spelling checkers

IN October's issue of *Practical Computing*, an enquiry was made in the Ask PC section about spelling-checking programs. I was pleased to see that Perfect Speller was one of the products mentioned in the response, but feel that the information given could be misleading.

Perfect Speller and a U.K. thesaurus is available free of charge as part of the Perfect Writer software given with the Advance 86 computer. However, PC-DOS and Apple IIe and Apple IIc versions of Perfect Writer II with their 50,000-word spelling checkers are also available from retailers at a price of only £149 and £99 respectively.

ELIZABETH WARHURST,
Thorn EMI Computer Software,
Farnborough,
Hampshire.

Curse the blinking cursor!

IN THE September issue of *Practical Computing*, John Lee, Timothy Lee and Carl Phillips showed us a program for developing alternative cursors, which was tested on IBM and Advance 86 machines. Maybe it works fine for WordStar, but it definitely won't with Perfect Writer, the word processor bundled with the Advance. So how can I get it to run?

A C RIX,
Matlock,
Derbyshire.

JOHN AND TIMOTHY LEE REPLY: Though our program resets the cursor to a flashing block for the IBM PC, Advance 86, Ferranti PC-860 and many look-alikes, when either the Perfect Writer word processor, or the later version Perfect Writer 2 is used, then the cursor reverts to the usual blinking underline. It is not our cursor program that is at fault, and the explanation of the behaviour you observe is given in the second paragraph of the article.

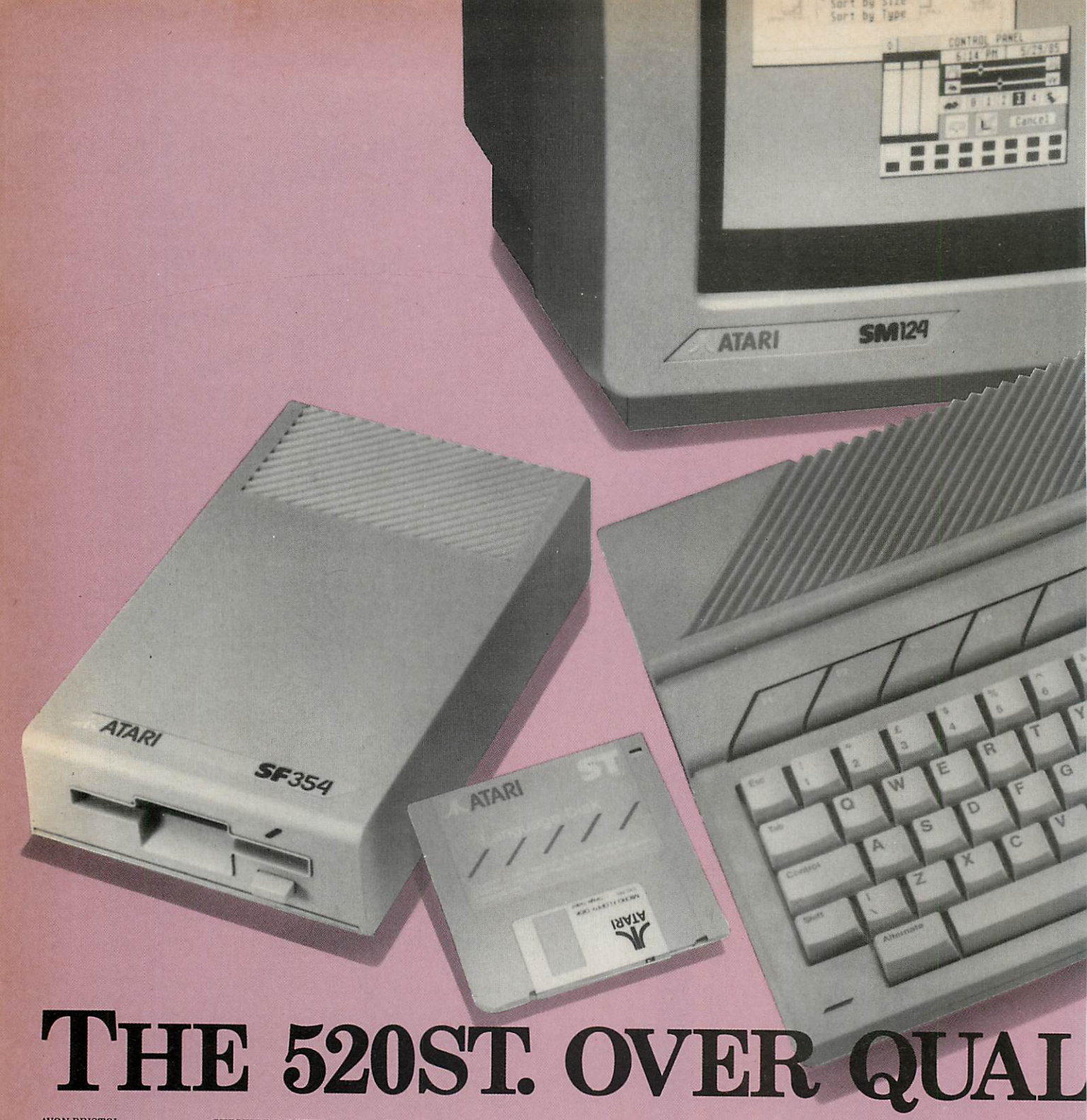
Though you initially set the system cursor to a block with our program, when you run Perfect Writer, it either turns the system cursor off and produces its own cursor from its own software, or it resets the system cursor. We are not sure which, but the result is that you get the blinking underline back. Even when you quit from Perfect Writer, the cursor remains a blinking underline. If you rerun our cursor program after leaving Perfect Writer, you will get the block cursor again.

The only way to get a block cursor while using Perfect Writer would be to alter Perfect Writer itself, so that it does not reset the cursor. We do not know how to do this. PC

WHERE IS IT? WHERE IS IT?! THIS MONTH'S 'PRACTICAL COMPUTING?
AH — THANKS! — JACKO SAID THERE'S A FEATURE ON THE 'HOT 100 SOFT-
— WARE?! BUT JACKO SAID IT WAS ON SOFT-
THANK YOU, ROGER — I THINK I CAN GUESS WHAT JACKO SAID IT WAS ON...
MITCH
MITCH

● Circle No. 137 ▶

The Commodore 128.
When you look at the facts they do seem to weigh rather heavily in our favour.
When you add it up, the Commodore 128 is really three computers in one.
It can run 64K, 128K and CP/M software. Giving it the largest range of computer software in the world. Making it as efficient in business as it is entertaining at home.
That's why Commodore has become the world leader in microcomputers.
And why, on balance, the Commodore 128 has no equal.
commodore



THE 520ST. OVER QUAL

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Computer Annex.
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FAILWOODFIELD
Mighty Micros.
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MANCHESTER M1
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GT. MANCHESTER
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Screens.

THE ATARI 520ST Personal Computer has a list of qualifications as long as your arm. With a powerful 16 bit processor and 512k of memory linked to high resolution graphics and 512 colours its work is fast, clear and sharp on your screen, no matter how demanding the task.

Controlling the 520ST is easy through its mouse and unique operating system incorporating GEM desk top manager, whilst its eleven peripheral connectors including MIDI interface enables it to mix and communicate easily with other computer products.

The ST which presents itself in smart modern styling comes with powerful BASIC

IFIED AND UNDERPAID.

plus Logo programming languages, a word processor and drawing programme, yet costs only £652* including disc drive and black and white monitor.

Why? Because at Atari we bring up our products to work hard for their living.

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Silicon Glen Ltd.
SHETLAND LERWICK
Tomorrows World.
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Cardiff Micro Computers.
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Laskys.
S. GLAMORGAN CARDIFF
South World Computers.
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Danum Computer Systems.
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Laskys.
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* PC-DOS and Concurrent CP/M
* Expandable memory
* Full expansion options
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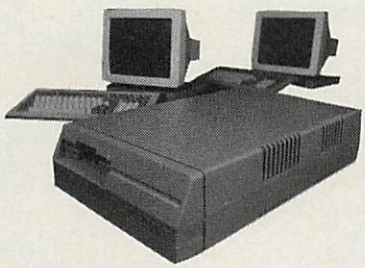

* Concurrent CP/M and PC mode
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* Full expansion options
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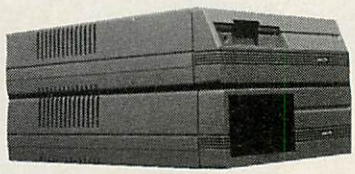

* Microsoft XENIX operating system
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* Full Ethernet capability on software release
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ALL MACHINES UTILISE AN INTEL 80286 PROCESSOR AT 6 OR 8 MHz WITH A 256K DISC CACHE

Our computers aren't meant to compromise or cut corners; they're meant to work. The technology built into these machines makes them immensely capable, and our designs exploit that potential to the limit.

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As a result, we believe our SPRITE microcomputers to be the best there are, in terms not only of performance but also price. Each of our machines runs an 8MHz 80286 chip in an environment which really puts it through its paces; the added feature of an intelligent disc cache makes each member of the SPRITE FAMILY incredibly fast.

And that's only the start. To some of the most sophisticated internal architecture ever devised, we have added all the networking and expansion facilities that anyone—in the foreseeable future—is likely to need.

We have constructed a family of microcomputers to serve the entire range of market needs, from a super-high specification desktop 'workstation' to the unlimited horizons of an integrated Xenix system: prices start from £5,995, and these machines can be configured to suit your needs exactly. We've also given the back-up of a one-year on site warranty to each product and support our dealer network extensively.

And all with one aim: to give the end-user the product *they* want, and not just the product we want to sell them. No compromises, just quality.

SPRITE

To find out more about the SPRITE FAMILY of advanced microcomputers, send a letterhead or business card to:
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Tel. 01-391 4433 Telex 8950511 ONEONE-G ref. 13114001
Where possible, please indicate your system size and requirements. This will help us to give you more precise information about how SPRITE can help you.

* IBM and IBM PC-AT are trademarks of International Business Machines.

● Circle No. 139

Epson printers

EPSON has launched a range of printers to consolidate its position in the market. The GX-80 is based on the LX-80 released early in 1985. It provides 100cps draft and 16cps NLQ printing, and can hook up to a range of micros, including the IBM PC, Apple IIc and Atari computers though a removable printer interface cartridge. The cost is £249 for the GX-80 and £50 for the printer interface cartridge.

Other new machines include the FX-85 and FX-105, both IBM compatible. Both NLQ quality and IBM emulation are selectable via an accessible DIP switch. Founts such as Pica, Elite and Roman as well as enlarged, emphasised, condensed, double strike underline and sub/superscript are selected from the front panel. Speeds are 160 cps draft and 32cps NLQ.

Additional features include automatic text justification of word-processed output, eight levels of graphics density, and up to 240 operator-designed characters downloaded from the 18K internal-memory buffer. The two machines cost £438 and £569 respectively. For more details telephone 01-902 8892.

Flipper

CIRTECH's Flipper expands Apple IIe or II+ RAM to 1Mbyte. The Flip Flop file manager also allows you to hold several programs in RAM simultaneously and switch between them. The card will fit any slot, thus allowing up to 6Mbyte in total. The cost is £350 and more information can be obtained on (0896) 57790.

Polaroid Palette for the BBC

POLAROID has produced a device for the BBC Micro which allows full-colour slides to be produced. Since the Polaroid Palette does not use the computer's VDU it is not limited by the display colours of the micro. It can improve the original screen image by filling in the raster lines, which makes colours more saturated and curves less stepped. The price of £850 includes all the software and hardware. For more details phone (07072) 78283.

TRIPLE X UNIX MICRO

THE U.K. firm Torch Computers has launched a Unix machine with a Mac-like front end, designed to overcome many of the traditional objections to AT&T's favourite operating system.

The Triple X has a powerful 68010 running at 8MHz, 1Mbyte of RAM plus 64K for bit-mapped colour graphics. In addition to a 720K floppy there is a 20Mbyte Winchester as standard. Communications include two serial ports and an on-board Ethernet controller. It can also use X-25 protocols, allowing direct access to packet-switched services. Maximum VDU resolution is 800-by-512, with up to 16 colours.

As well as the icon-driven front end, the system comes with full System V Unix. The entry-level system costs £3,995. Details on (0223) 841000.

Battery-powered work station

FOLLOWING in the wake of ICL's One Per Desk, and now the Acorn Communicator — see page 61 — Tandata has joined the workstation club. The Tandata PA can function as a viewdata terminal, and access public and private databases. It has an internal V-21/V-23 modem with an autodialler. There are options of ROM terminal emulators for IBM 3270 or VT-100 protocols.

The operating system is based on Unix with multi-tasking facilities, and the chip is an 80C88. Data is stored in up to 768K of battery-backed RAM. There is an on-board spreadsheet and calculator, which can be accessed at any time. The Tandata PA itself is mains powered, but can also use internal batteries for portable operation. The batteries are charged automatically while it is connected to the mains.

The entry-level price is £999 for the basic PA 100 series, and the multi-user 200 series will start from £1,299. All prices include a 12in. colour monitor and a free registration to Easylink or Telecom Gold. Details on (06845) 68421.

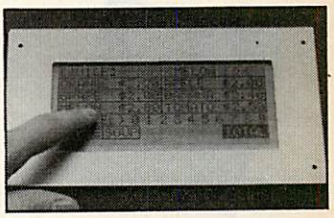
Bromcom's Hypermicro

FOLLOWING the Superstar, Bromcom has added another ultra-superlative with its Hypermicro version. This offers Concurrent DOS 4.1 with DR-Net, and can handle up to 16 16-bit slave 80186 processors from its 80186 master processor. Each card can have from 512K to 1Mbyte RAM. Each of the 16 users can have up to four virtual screens under Concurrent DOS.

Under DR-Net and Arcnet, up to 255 individual IBM PCs or Apricots can be networked to the system. In addition to Concurrent DOS, the Hypermicro will also run Impos and Turbodos. The basic configuration of one 20Mbyte Winchester, one 360K floppy, screen and keyboard costs under £3,000. More details on 01-461 3993.

HARDWARE SHORTS

- Sord has announced a multi-user Unix system called Unibox with a 68010. Prices start at £5,400 excluding a keyboard or VDU. More on 01-631 0058.
- A 20Mbyte removable cartridge disc system is available for the Apricot, Wang and Panasonic PCs from Honeycomb. The cost is £3,695. Details on (0892) 45433.
- Wicat has launched the Wicat 1250 68000-based micro, which will run under Pick or Unix. Cost is £9,500. More on (0276) 686186.
- Olivetti has announced the Unix PC 3B1. Prices start at £5,915 for this 68010-based machine. More information on 01-785 6666.
- Husky has introduced a 496K version of the Husky Hunter. The cost is £4,880. Details on (0203) 668181.
- Buy your own Transputer: Rapid Recall has Transputer boards for the IBM PC. Prices start at £4,400 with Occam and £2,900 without. More on (0494) 26271.
- PC Mouse has been reduced in price to £160. More information on (07073) 34774.



LCD touch-screen overlay

EPSON has announced an LCD screen overlay which allows direct inputting of data by touch. The technology consists of a matrix of transparent electrodes formed on a glass film panel. Finger pressure on the panel causes the upper and lower electrodes to make contact.

The currently available version provides exact positions but is limited in resolution. A later model will use transparent stripe electrodes with a uniform resistor block set at right angles to them. An analogue to digital converter is used to translate the voltage across the panel into information about position. More information on 01-902 8892. PC

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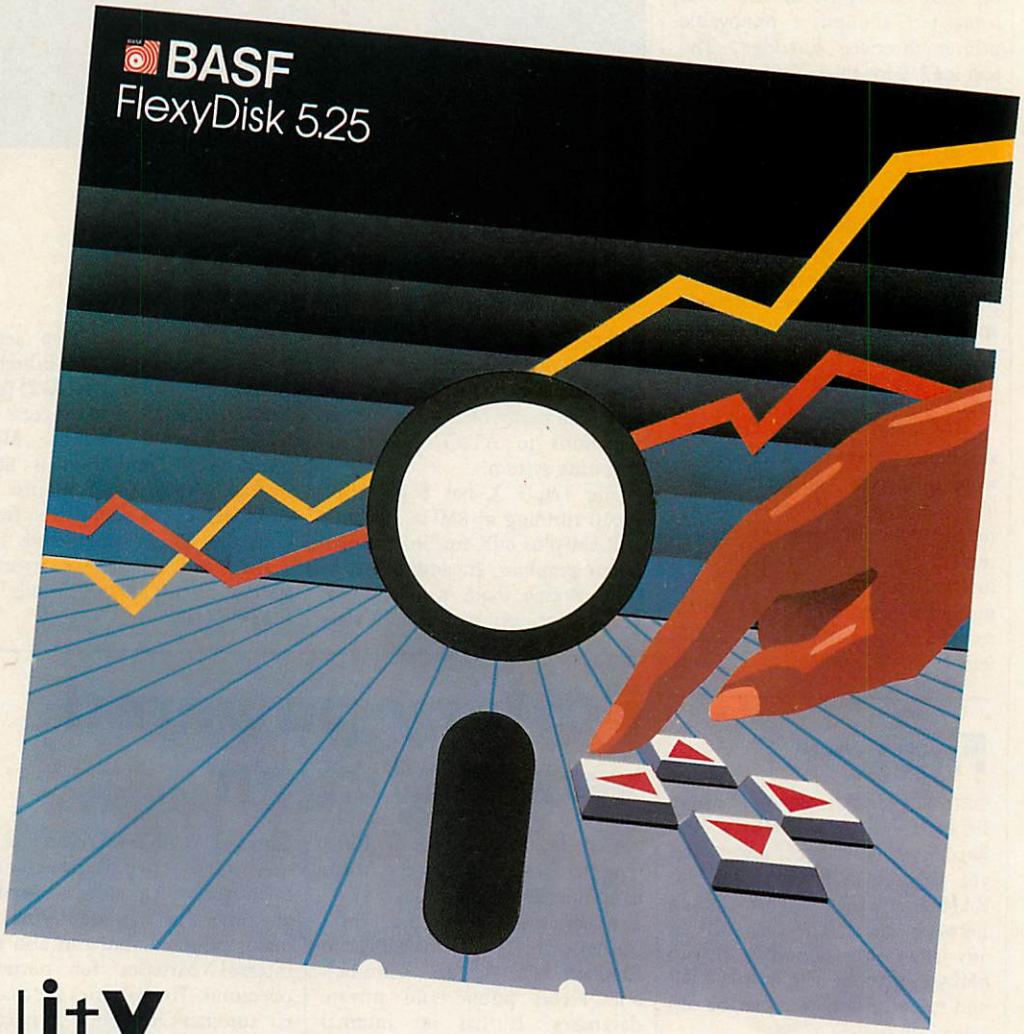

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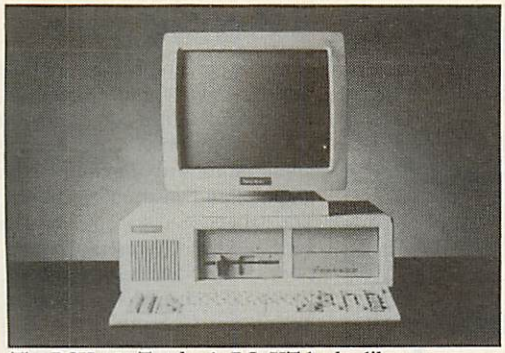
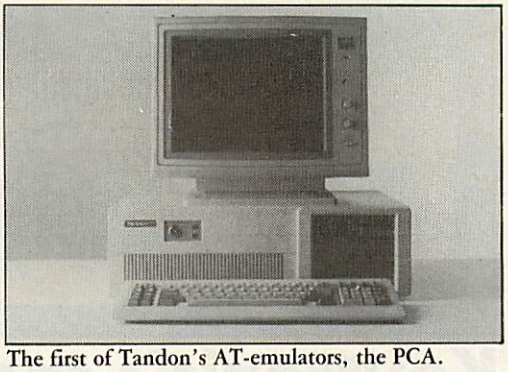


The PCX-10: Tandon's PC/XT look-alike.



The first of Tandon's AT-emulators, the PCA.

TANDON COMPUTER

TANDON COMPUTER CORPORATION has announced a range of IBM-ulators. Prices start at £1,295 for a PC clone, and £1,595 for the PCX-10, a PC/XT look-alike which includes screen and 256K of RAM. A 20Mbyte Winchester version costs £1,795. The first of the AT series, the PCA, with a 1.2Mbyte floppy, 20Mbyte Winchester, 512K RAM and screen costs £2,795; a 30Mbyte version costs £3,095.

Tandon Computer Corporation is a newly created micro-manufacturing division of the disc-drive manufacturer Tandon Corporation, which supplies the drives for the new machines. The President of the micro company is Chuck Peddle; he is interviewed on page 85 of this issue.

Contact Tandon Computer (U.K.) Ltd, 5 Suttons Industrial Park, London Road, Reading Berkshire. Telephone: (0734) 664676.

PC-Plus and Xtender

PC-PLUS allows extra terminals to be hooked up to the IBM PC. Each connects to a slave 8088 processor running at 8MHz with 256K RAM. Memory sizes are 512K to 1,024K.

Two serial ports provide communication to the terminal and to an optional printer or modem. Up to 31 cards can be supported. The cost is £995. For more information contact Circulas Ltd, 69-73 Theobalds Road, London WC1. Telephone: 01-242 0223.

Xtender is a similar product from KPG, which allows up to eight ASCII terminals. It has an on-board 80286 and various RAM options. Prices start at £4,999. Details available from KPG, 578-586 Chiswick High Road, London W4. Telephone: 01-995 3573.

2000 PC

DIGI-DATA's 2000 PC system is a half-inch streaming tape drive which can handle 2,400ft. reels. The price for the PC/AT is £4,360, and £3,960 for XT systems.

Typically such reels will store about 40Mbyte at 1,600 bits per inch. Eight-bit parallel recording with parity and read after write verification of data are supplied as standard.

For further information contact Digi-Data, Unit 4, King's Grove, Maidenhead, Berkshire SL6 4DP. Telephone: (0628) 29555.

Epson Taxi PC

FOLLOWING the launch of its Taxi operating system on its MS-DOS machine in July, Epson has launched an IBM compatible called Taxi PC. The IBM version of the icon-driven system is available separately.

The entry-level system comes with 256K RAM and one 360K floppy and costs £777. The twin-floppy system costs £898, and the hard-disc model costs £1,666. All prices quoted exclude the monitor. Standard interfaces include one parallel port and one serial port. There are three IBM slots.

Epson has also launched a 4.8Mbyte 5.25in. floppy-disc drive. This is mainly a backup device to hard discs. Speeds comparable with the IBM PC/XT hard disc are claimed. Special Maxell discs are used. The unit will cost about £1,000.

Contact Epson (U.K.) Ltd, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892.

Expert system advises on data protection

INTELLIGENT ENVIRONMENTS has produced an expert system which advises on the Data Protection Act. It establishes what sort of data the user has, whether or not the user should register, and why. The system has been verified by three independent accountancy firms.

The expert system runs on PC compatibles but requires at least 256K of RAM. The cost is £23, including VAT and packing. For further details from Intelligent Environments, 20 Crown Passage, London SW1Y 6PP. Telephone: 01-930 2967.

IBM SHORTS

- The Midwich IBM-55/5 is a 5Mbyte Winchester. The cost is £349. More on (0379) 4131.
- Memorex has produced ready-formatted boxes of discs for the IBM PC. The price is £35 for a pack of 10. Details on (0784) 51488.
- Labelmaker II allows labels to be produced from Framework files. The price is £140, and more information is available on 01-979 5533.
- Solid State Nutronics has announced new prices for its PC clones: £1,199 for a 10Mbyte XT system, and £1,499 for a 20Mbyte version. More on 01-788 1982.
- Viewnix is a windowing utility for the IBM Xenix operating system. The price is £190. More information on (0672) 54675.
- IPL-II allows files to be swapped between IBM PCs and DEC minis. The cost is £350. Details on 01-629 5932.
- Alpha Micro has launched a backup system based on a video-tape recorder. Up to 80Mbyte can be stored. More on (0753) 821922.
- Async-4 provides four serial ports. The cost is £395, and it is available from 01-373 7714.
- Crompton's Keyboard Safe enables you to lock away your keyboard should you so wish to do so. The price is £85. More information on (0908) 311544.
- Ferranti now offers a 20Mbyte version of its PC-860 XT-alike. The cost is £2,795.

Compro 88

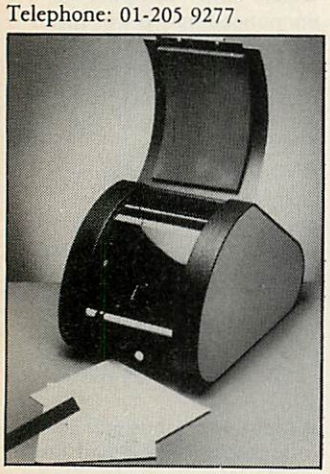
ANOTHER low-cost IBMulator has been launched, this time by the British company Computo-processing Ltd. A dual-360K machine with 640K RAM, MS-DOS and a monitor costs £995. The 10Mbyte XT-alike costs £1,650, and a 20Mbyte version with tape backup £2,890. A Philips colour monitor plus graphics card costs £414.

The systems are assembled in the U.K. Information on them can be obtained from Computo-processing Ltd, 195 Wardour Street, London W1V 3FA. Telephone: 01-734 2846.

(More news on next page)

Image scanner and OCR

WONG'S INTERNATIONAL has launched a combined image scanner and optical character recognition unit. Software then allows detailed manipulation of the captured image or text. The unit connects to the IBM or compatible via a cable and short card. The cost is under £3,000. More information from Wong's International (Europe) Ltd, 72 Capitol Park, Edgware Road, London NW9 0EW. Telephone: 01-205 9277.



Keytronic's speech input keyboard

THE KEYTRONIC 512V adds speech recognition to normal keyboard operation of PCs and XTs. A vocabulary of up to 160 words can be set up. The speech recognition is handled through the unit's internal electronics, so no modification is required to your existing software; commands are presented to the host just like keyed input.

The keyboard comes with a noise-cancelling microphone, foot switch and vocabulary software. The cost is £1,175. Details from Ceretech Electronics. Telephone: (0420) 88674.

Lock up your PC

TWINLOCK has produced a lock-up unit for your PC. It has been designed partly in response to the requirements of the Data Protection Act, which specifies that appropriate security measures shall be taken against unauthorised access. The cost is £575. For further information contact Twinlock at 36 Croydon Road, Beckenham, Kent BR3 4BH. Telephone: 01-658 5931.

TBasic

TBASIC is yet another flavour of the world's most popular language, this time designed specifically for CAD, scientific and engineering applications, with the emphasis on graphics and instrument control. The language costs $495 and is available from Transera Corporation, 3707 North Canyon Road, Provo, Utah 84604, U.S.A. Telephone: (U.S. area code 801) 224-6550.

Hal's Secure

SECURE is an encryption device from Hal Communications. It is based on the American classified DES microprocessor chip and associated software. Such is the awesomely secret nature of this device that permission to use it was also required from GCHQ.

The unit plugs in to an expansion slot, and after a 16-character password has been entered it encrypts and decrypts all data as it is input or accessed from disc. It costs about £800 from Hal Communications, Invincible Road, Farnborough, Hampshire GU14 7QU. Tel: (0252) 517175.

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Hard Desks 10MG	£589.00
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Philips 7502 (green)	£74
Philips 7522 (amber)	£78
Philips 7513 (IBM)	£89
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Microvitec 1451	£235
Microvitec 1441	£389
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Epson JX80	£425
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Epson LQ1500	£825
Epson H180	£355
Canon 1080A	£251
Canon 1156A	£339
Juki 6000	£209
Brother HR5	£128
Brother HR15	£325
Brother HR25	£630
Brother HR35	£685
Brother 1009	£154
Brother EP44	£184
Brother 2024	£779
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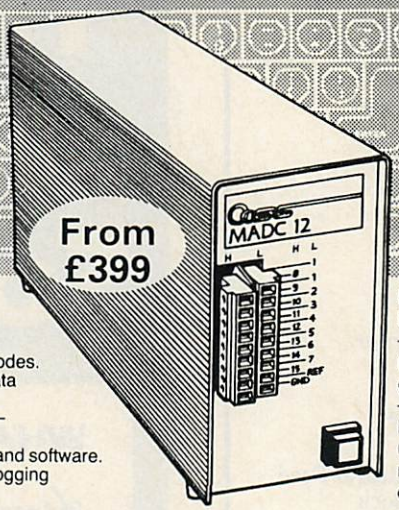

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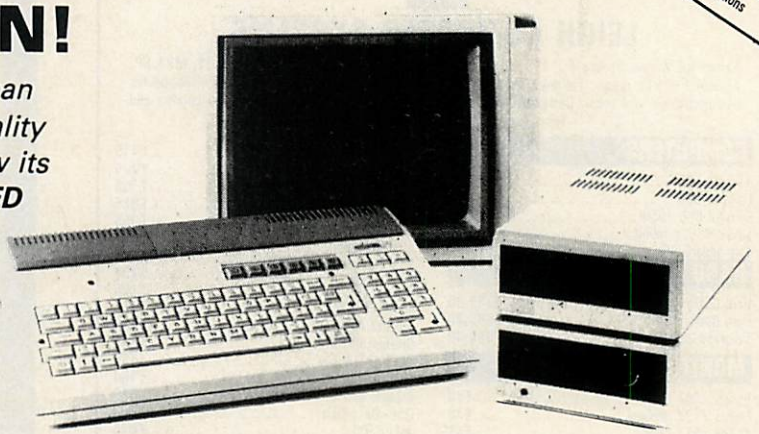

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GEM DEVELOPMENTS

PROSPERO SOFTWARE'S Gem Applications Development Language system has been designed in co-operation with Digital Research to provide an environment in which Gem applications software can be written. It runs on the IBM PC and compatibles and 68000-based machines.

The Gem Applications Development System has two components: a language system from Prospero, and a Programmer's Toolkit from Digital Research. The suite can be used to port Macintosh software to the PC environment and to set up Wimp interfaces on the IBM PC. The final program can be distributed freely without a run-time licence or royalties.

To use the software, the programmer designs the front-end menus, icons, and dialogue boxes. Then a Gem skeleton is fleshed out with specific details. After compilation, the program is linked with various subroutines and produces the final code.

The software costs £320 for the Fortran-66 and Pascal versions for the IBM PC. Systems for the 68000 family will be available in due course. The Gem Programmer's Toolkit, which is also necessary, costs £495, and is available from Digital Research. Contact Prospero Software Ltd, 190 Castelnau, London SW13 9DH. Telephone: 01-741 8531.

SOFTWARE SHORTS

- Quest has released Cash Trader for the Amstrad machines, Atari 520ST, Apricot, IBM PC and BBC Micro. More on (04215) 66321.
- Psion has announced Q Draw, a drawing package for the QL. The cost is £14.95. More information on 01-723 9408.
- A Russian word-processing package has been developed by Vuman Computer Systems Ltd. More information on 061-226 8311.
- Infalink allows file transfers between micros and minis. The cost is £179. Details on (0984) 24059.
- Ashton-Tate has announced two publications for users of its products: *dBase II Applications Register* and *Technotes U.K.* More on (0628) 33123.
- Date Tickler is a calendar, scheduling and appointment-book program for the Apple II, IIe and IIc with a minimum of 64K. Telephone: (U.S. area code 415) 428-1156.

Le Lisp

LE LISP EST ARRIVE! Logotron has been appointed as U.K. distributor of the Lisp implementation written for PCs by the French firm ACT Informatique. Le Lisp is available for the Apple Macintosh and MS-DOS machines including the Apricot.

Le Lisp has over 2,000 built-in functions, and is claimed to be the fastest interpretation of Lisp around. It requires 512K RAM on the Macintosh, or 256K on MS-DOS machines. The cost is around £600. Details from Logotron Ltd, Ryman House, 59 Markham Street, London SW3 4ND. Telephone: 01-352 1088.

Q-Pro 4 database generator

Q-PRO 4 is a fourth-generation applications-development system for micros. It can handle up to 255 files of up to 4Gbyte at the same time, with no restrictions on record size or number of records in a file. The package includes a Report Generator.

Q-Pro 4's record-locking and file-locking works with local area networks, multi-user and single-user systems, both eight-bit or 16-bit. Operating systems for which it is available include PC-DOS, MS-DOS, Concurrent CP/M, CP/M, MP/M and Turbodos.

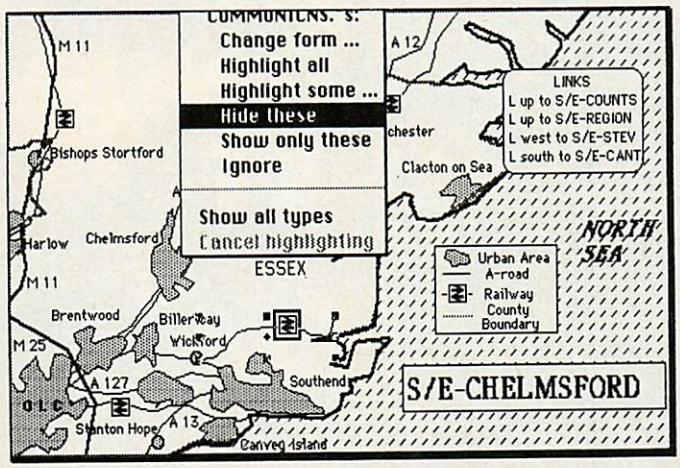
The single-user version costs £540, and the multi-user system £722. More details can be obtained from DDL Systems Ltd, Fernleigh House, North Street, Punnetts Town, Heathfield, East Sussex TN21 9DT. Tel: (0435) 830680.

Caxton PCW-8256 software

CAXTON SOFTWARE has released details of its pricing structure for software for the Amstrad PCW-8256 and CPC-6128 computers. The Cardbox database will cost £99.99 including VAT; the typing tutor Touch'n'Go will cost £24.99, and the outline processor Brainstorm will cost £49.99. The keyboard enhancer Smartkey is priced at £49.99. Caxton is at 10-14 Bedford Street, London WC2E 9HE. Telephone: 01-379 6502.

Amstrad software

NEWSTAR is offering a wide range of classic CP/M software for the Amstrad disc machines. The managing director is William Poel, formerly of Amsoft. For a full list of software on offer, contact New Star Software Ltd, 22 Middleton Road, Brentwood, Essex CM14 8DL. Telephone: (0277) 213218.



U.K. maps for Filevision

PITMAN has brought out a two-disc set of maps to go with the Mac database package Filevision. Called Mapvision, the price is £89.95 including VAT. One disc contains maps of the U.K. and Europe, the other maps of the rest of the world. Details from Pitman Publishing Ltd. Telephone: 01-379 7383, extension 267.

Atari ST RAM disc utility

KUMA COMPUTERS has released its K-RAM utility for the Atari 520ST which allows RAM discs to be set up. Additional features include a Help facility and an option for decreasing floppy write times by up to 50 percent. K-RAM can also allow the user to gain more free RAM by reconfiguring the operating system.

K-RAM costs £29.95 including VAT and is available from Atari dealers. More information from Kuma Computers Ltd, 12 Horseshoe Park, Pangbourne, Reading, Berkshire. Tel: (07357) 4335.

Mactracks

MACTRACKS records keyboard strokes and mouse movements and then lets you assign them to specific keys for playback. Normally these macros are called up by using the Cloverleaf key plus another key. Up to 5,000 characters can be stored on any one key.

The program is compatible with any Mac software, and is operable with either the mouse or Mac Turbo Touch. Mactracks costs £29. Details from P&P, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744.

G-term

G-TERM from Wordmongers is a complete comms package which includes a modem, software, cables and a Telecom Gold mailbox number. The system is available for a range of over 50 micros, and the cost is £395. A version for the Amstrad PCW-8256 is under preparation.

More information can be obtained from Wordmongers Ltd, Unit 21, Edison Road, Rabans Lane, Aylesbury, Buckinghamshire HP20 1SW. Telephone: (0296) 37878. PC

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ACORN SHINES

ONE OF the stars of the show was Acorn's new Communicator, which is reviewed on page 61 of this issue. Acorn was also showing an interactive-video product, which it expects to be popular in the wake of the Doomsday Project it is working on with the BBC. Details on (0628) 25265.

Other products being shown were a 140Mbyte file store for Econet, a tape streamer and an X-25 gateway. The gateway allows up to 16 simultaneous stations to communicate with a wide-area X-25 packet-networking system. These products are due to become available in the second quarter of 1986. Acornsoft has also announced a version of Micro Prolog. For further details ring Acorn on (0223) 214411.

Walters PC/XT clone

IBMULATOR prices continue to drop with the announcement of the Walters IBM PC/XT clone with 256K RAM, keyboard, disc controller, 10Mbyte Winchester and DOS, but no screen, for £1,276. Lower-spec configurations are also available. More information on (0494) 32751.

COMPEC SHORTS

Kuma has launched K-spread for the Atari 520ST. This mouse-driven spreadsheet costs £49.95. More on (07357) 4335.
Laser has produced a database for the Atari 520ST which uses the Gem interface. More information on (0442) 827933.
Hitachi has announced its CD-ROMs which offer 552Mbyte, with a transfer rate of 176Kbit per second. Details on 01-741 2001.
Telindus has launched the Lotus modem, designed to meet the full CCITT V-29 and V-27 specifications. More on (0635) 30110.
Cornel Electronics, an Irish modem manufacturer, has released a range of comms products. Details on Dublin (0001) 523522.
Northern Telecom released details of its Amstrad local network. It supports the full range, including the PCW-8256, Apricots and IBM machines. Details on 061-941 2522.
BOS was showing its BOS/LAN. It supports both Omninet and Arcnet architectures, as well as BOS on the Atari 520ST. Details on 01-831 8811.
Ikon Pixel Engine from Digisolve is a powerful graphics machine. The cost is about £2,500. More on (0977) 513141.
Corvus has announced new network products, including a Macintosh Omninet network interface. More information on Geneva (010 41 22) 327289.
Jarogate unveiled an upgrade of its Sprite micro with an 8MHz chip replacing the old 6MHz. Details on 01-391 4433.

Cumana card

CUMANA was showing the Astron Integrated Circuit Card — the U.K.'s answer to the smartcard. These credit-card-sized plastic cards contain within them either ROMs, EPROMs, electrically alterable EEPROMs, and even CMOS RAM backed up by a five-year lithium battery. The chips hold up to 1Mbyte of memory, and can be used for entire applications programs. For example, Pocket WordStar is to be released soon. Interfaces for most popular business machines are available.

Other new products from Cumana included Upgrade, which offers 512K RAM, a 68008, a double-density floppy controller and a Winchester controller for the BBC. The QL version omits the 68008 but includes additionally serial and parallel ports. The cost starts at £695. More on (0483) 503121.

Minimo plus Datatalk

STEEBEK has announced a comms package consisting of the Minimo Plus 2 Hayes-compatible modem and a customised version of Datatalk comms software. It costs £345

The software handles automatic access, saving to disc and retrieving data and mail from remote computers and electronic-mail services. It also offers presets to make dialling faster. The software will work with MS-DOS machines. Further details on (0635) 33009.

Hayes hits U.K.

THE WELL-KNOWN U.S. modem manufacturer Hayes has arrived with a clutch of products. Smartmodem 1200 is fully BABT approved, uses the Hayes Standard AT Command Set, and comes with auto-dial/answer and built-in diagnostic procedures. The cost is £575.

This product can be used with Smartcom II, a communications package which features terminal emulation, auto-answer, autodial and auto log-on. Up to 25 different sets of parameters can be stored to allow network services to be accessed easily. Smartcom is available for use on the IBM PC and compatibles. The cost is £140.

Finally, there is the intriguingly named Please, a database product which can utilise the Hayes modem. It can also send and receive data from other packages such as Lotus 1-2-3 and dBase, and can handle up to 999 characters per field, 99 fields and 2,000 characters per record. The price is £185. Details on all these products on 01-847 4471. PC

PC Promise

PC PROMISE is an IBM database from the new British company Duncan Databases Ltd. This menu-driven package allows screen layouts to be defined using a painting technique. Up to 250 fields per record are allowed, with files as big as the disc storage available. PC Promise is claimed to be able to index 1,000 records in 40 seconds, and select 20 records out of 1,000 in 25 seconds. The cost of the package is £175. Details on 01-942 2538.

Wang

WANG was showing its APC, an 80286-based MS-DOS machine. A typical AT-like configuration starts around £5,080 for a system with a 1.2Mbyte floppy, 20Mbyte Winchester, keyboard and screen. Other options include Xenix System III and In/ix, both able to support up to four simultaneous users on the APC. Wang packages such as Wang PC Word Processing and Database are also available. For more information phone 01-560 4151.

Wang's APC: claimed to be twice as fast as the IBM PC/AT.

CALL FOR INTERNATIONAL STANDARDS

IF MARKET credibility is the name of the game, then IBM has won hands down, judging by the professional personal-computer conference organised by the *Financial Times*.

The third in a series, the conference is a meeting of the great and the good in the personal-computer world. This year the proceedings were dominated by the presence of IBM to a degree which would have seemed immoderate even a year ago. In addition to Tony Santelli, IBM vice-president responsible for personal computers in Europe, most speakers drew on their experiences as manufacturers or distributors in an IBM or IBM-compatible environment.

OUTSIDER

The exception was Robb Wilmot, chairman of ICL. He showed a slide bearing the MIS Managers' Motto 1985: "No one ever got fired for buying IBM", but countered it with a second slide, the MIS Manager's Motto for the year 2000: "No one ever got fired for buying product to International Standards."

Wishful thinking? Maybe; but Dr Wilmot argued that there was no reason why professional products such as personal computers had to be complex and expensive, while calculators, cameras and compact-disc players were simple to use and relatively inexpensive.

The solution to the problem lies in the development of true international standards, he said. Citing the failure of MSX he asked whether it would continue to fail. "I doubt it," he asserted. "MSX-2 is coming — and if it takes till MSX-9 to achieve a global standard (the Japanese) will get there in the end because the marketplace wants it."

The emergence of standards would, he claimed, promote innovation, encourage ease of use and lead to lower prices in both hardware and software. Only then would the pace of acceptance gather momentum, thus enabling the personal computer to move beyond the 20 percent saturation level to which its complexity and lack of standardisation currently relegated it, to something closer to the 90 percent saturation level achieved by the telephone, in the West.

That was not a view which cut any ice with Tony Santelli of IBM. He disposed of the dinosaur theory of computer evolution — that mainframes are unwieldy beasts destined for extinction. He looked forward to 1990, when mainframe links and networking would vastly increase the number of personal computers in use, to the extent that there would be an average of one work station for every two employees in the U.K.

LOCAL KNOWLEDGE

Who will supply them is an open question. Vittorio Levi, executive vice-president of Olivetti, emphasised that the personal-computer market in Western Europe is expected to grow at twice the rate of the U.S. market from 1985 to 1988. He asserted that European manufacturers are best suited to understand the needs of the various European markets with regard to both hardware and software.

Even so, European software companies are unlikely to have things all their own way. Jim Mirrielees, managing director of international operations for Ashton-Tate, pointed out that although the European software market could expect to achieve compound growth of 46 percent between 1985 and 1988, U.S. companies were well placed to take a substantial share of this. The three market leaders Lotus, Microsoft and Ashton-Tate already control 25 percent of the European market.

ONLY A PRODUCT

However, whether even the larger software companies are geared up to play a major continuing role in the market is questionable. Opening the conference Ronald Cohen, executive chairman of Alan Patrico and Associates, a venture capital company, said that two important lessons to be learned from the personal-computer market were that "a product is not a business" and that "£100 million of sales is not what it used to be." They are lessons which software companies will ignore at their peril. PC

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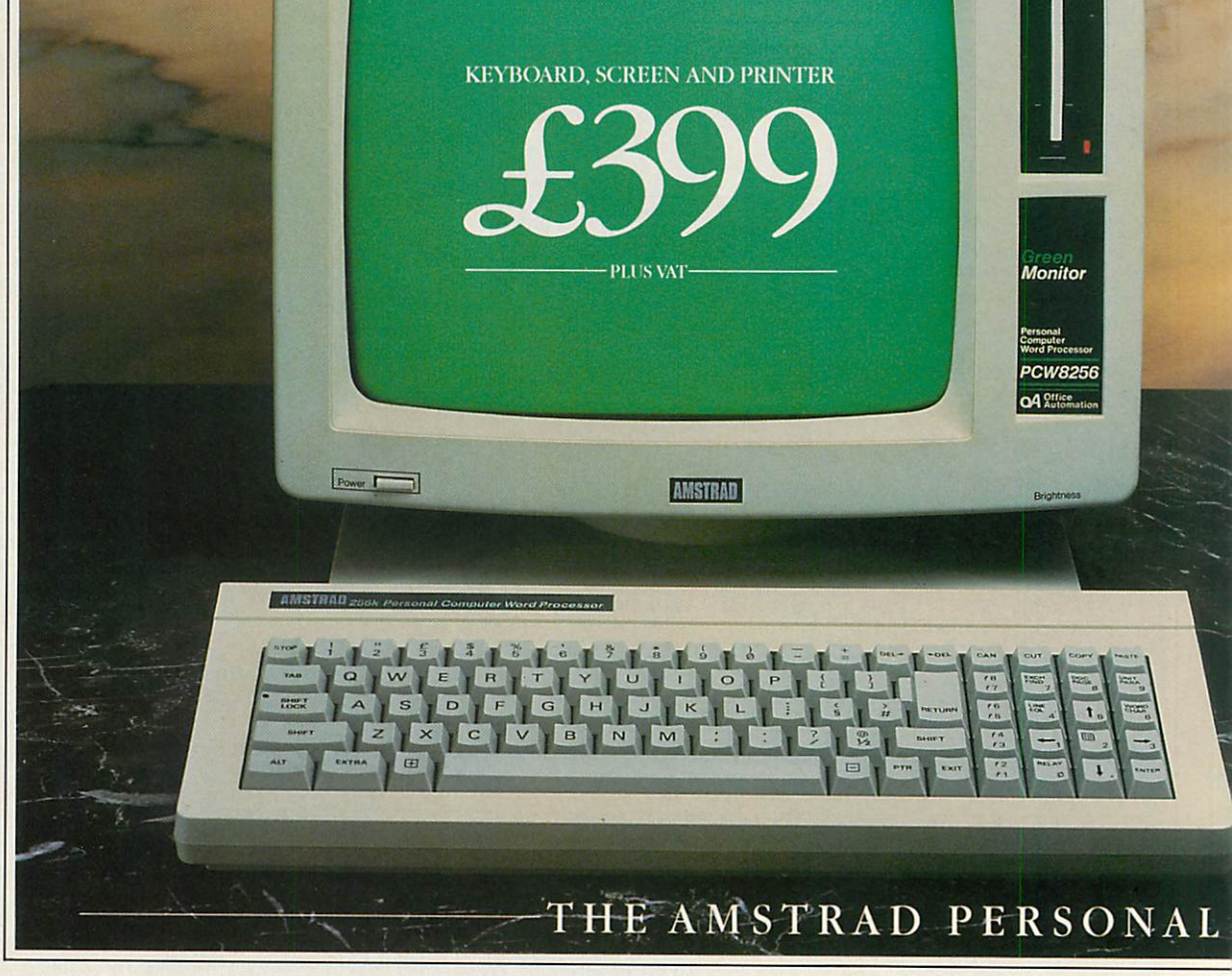

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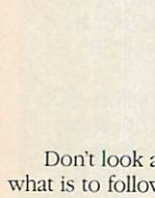

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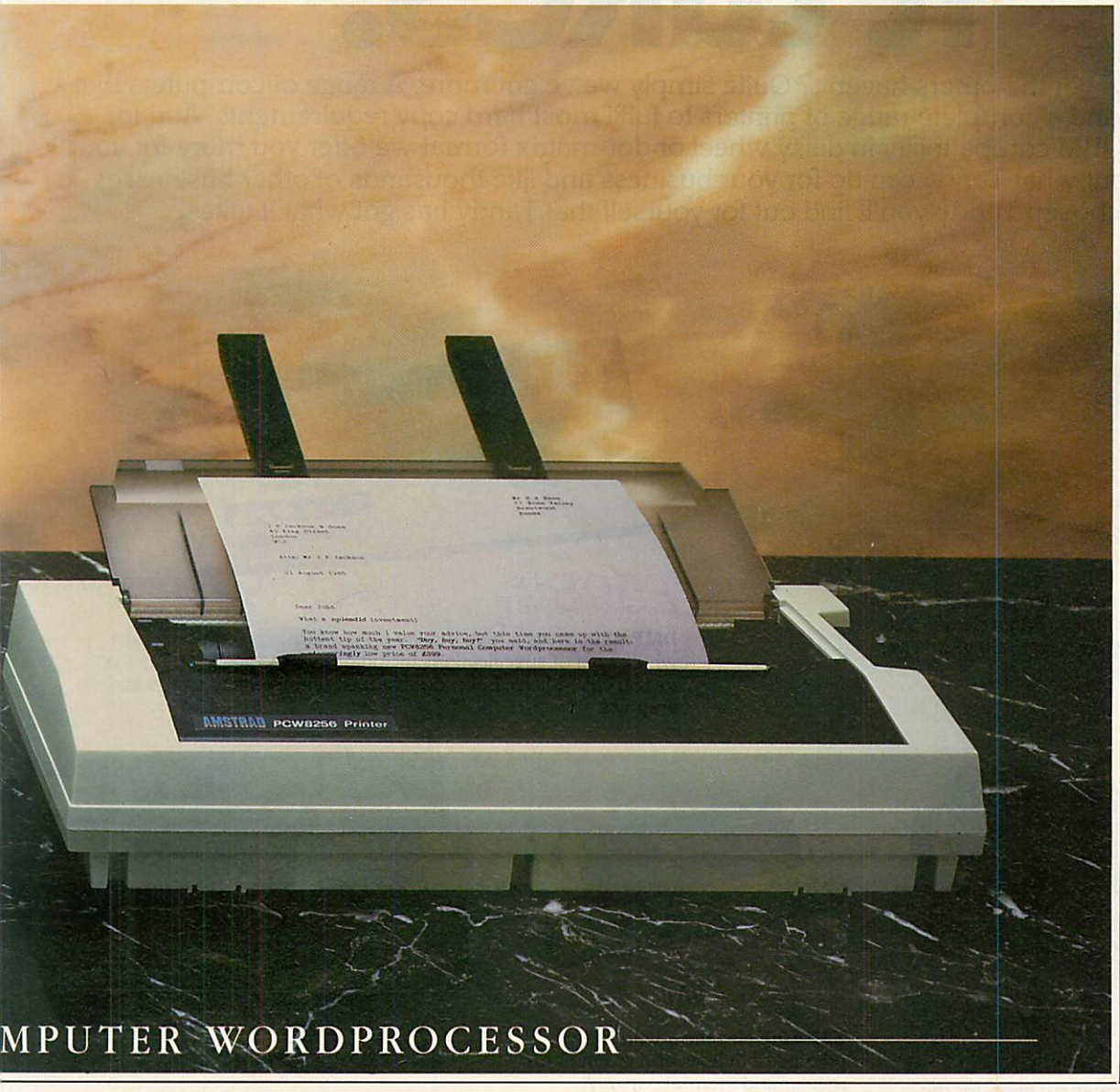

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BY MIKE LEWIS

TAKING THE MICKEY

A pair of Basic subroutines to operate the Microsoft mouse from the IBM PC.

One sure sign of the success of the mouse is the number of software packages that now boast support for the electronic rodent in one form or another. There is the obvious example of the Apple Macintosh, where mouse-based software is the rule rather than the exception. On other types of machine too, more and more applications now allow you to use this handy device, either as an integral part of the program or as an optional extra.

But how easy is it to interface the mouse with your own programs? If you use a Mac, you are in luck, especially if you have version 2.0 or later of Microsoft's Macintosh Basic. Here you will find all the commands and functions you need for manipulating the mouse printer, testing the button, and so on.

DIY MOUSE CONTROL

With other systems, do-it-yourself mouse control is a little more tricky. Much depends on the type of mouse you buy and on the language you use. In the MS-DOS world, there is a lot to be said for installing a Microsoft mouse, especially if you program in one of the dialects of Microsoft Basic. Then the operating system, language interpreter and mouse driver will all have come from the same source, which in this case, at least, does make life a little easier.

The Microsoft mouse comes in two varieties. One of them connects to the computer's serial port and can be used with most MS-DOS systems. The other is designed for the IBM PC and compatibles, and includes a board which plugs into the IBM expansion bus. It is this so-called bus version which I have used for the program in this article, although the basic concepts are the same for both types.

MUSICAL

The disc accompanying the Microsoft mouse includes a sample program in Basic which is supposed to simulate a piano. This piece of software leaves a lot to be desired, from both a programming and a musical point of view. So to help explain how mouse software works I have written an alternative demonstration program, part of which appears in the listing.

The aim of the program is to produce Macintosh-style pull-down menus. It displays, at the top of the screen, the names of various menu options. If you move the mouse pointer to one of these names and press the button, a window opens beneath it in which further options appear. As you move the pointer up and down, still holding the button, a highlighted bar moves with it. The option which is highlighted when you release the button is the one which the program acts on.

The program as shown here is in fact a cut-down version. There is only one option at the top of the screen and there is no attempt to restore the previous display when the window is closed. Still, it should provide a useful starting point for those who wish to go further.

The first task is to load the mouse driver into RAM, which you do simply by typing Mouse at the DOS prompt. Once loaded, the driver can be called from Basic, just like any other external subroutine. Its segment address and offset are held as integers at fixed locations within Basic's data segment, and are therefore accessible by Peeks — see line 1110.

ASSEMBLER

If you are programming in assembler or any other language that allows direct execution of interrupts — Turbo Pascal and many versions of C are in this category — you can get at the mouse routines by means of Int 33H. The parameters, which are loaded in the AX, BX, CX and DX registers, are the same as for the Basic Call command. For Microsoft-compatible compiled languages, the mouse software includes a special library procedure for calling the driver.

The next step is to initialise the mouse. This is achieved by calling the driver with a zero parameter — see line 1130. Every mouse call requires exactly four parameters, the first of which is a function number. Function 0 is the Initialise/Reset function, and since this takes no further parameters the other three arguments are dummies.

Next, you have to decide how you want the mouse pointer to

(continued on next page)

MOUSE DEMO PROGRAM

```
100     'Part of a program to demonstrate use of a mouse with pull-down menu
120     DEFINT A-Z

1000    'Initialisation routine. This must be exectuted at the start
         of the program
1030    DIM MENU$(6): FOR J=0 TO 6: READ MENU$(J): NEXT J
                                    'Set up array holding menu text
1040    DIM CURSOR(15,1): FOR J=0 TO 15: READ CURSOR(J,0): NEXT J:
                          FOR J=0 TO 15: READ CURSOR(J,1): NEXT J
                                    'Set up screen and cursor masks
1050    HOTSPOTH=0: HOTSPOTV=3      'The cursor's hot spot
1060    BLACK=0: WHITE=1            'Colours for box filling
1070    INITIALISE=0: CURSOR.ON=1: CURSOR.OFF=2: GET.STATUS=3: SETSHAPE=9
                                    'Function numbers for mouse routines
1080    HEAD.TL.H=80: HEAD.TL.V=0 : HEAD.BR.H=200: HEAD.BR.V=8:
        MENU.TL.H=80: MENU.TL.V=0 : MENU.BR.H=200: MENU.BR.V=56
1085                                'Pixel co-ords of menu heading and
                                     of menu (TL=top left, BR=bottom rt,
                                     H=horizontal, V=vertical)
1090    DEF FNINHEAD(H,V)=
            H>=HEAD.TL.H AND H<=HEAD.BR.H AND V>=HEAD.TL.V AND V<=HEAD.BR.V
                                    'Function to determine if a pixel
                                     is within the menu heading
1100    DEF FNINMENU(H,V)=
            H>=MENU.TL.H AND H<=MENU.BR.H AND V>=MENU.TL.V AND V<=MENU.BR.V
                                    'Similarly with entire menu area
1110    DEF SEG=0: MOUSESEG=256*PEEK(207)+PEEK(206):
                   MOUSE=256*PEEK(205)+PEEK(204)+2: DEF SEG=MOUSESEG
                                    'Segment and offset of mouse driver
1120    SCREEN 2: CLS: COLOR 0,0,1
1130    CALL MOUSE(INITIALISE,X,X,X)
                                    'Initialise the mouse (note use of
                                     dummy parameters - X)
1140    CALL MOUSE(SETSHAPE,HOTSPOTH,HOTSPOTV,CURSOR(0,0))
                                    'Define mouse cursor
1150    CALL MOUSE(CURSOR.ON,X,X,X)
                                    'Switch on mouse cursor
1160    LINE (HEAD.TL.H,HEAD.TL.V)-(HEAD.BR.H,HEAD.BR.V),WHITE,BF
1170    LOCATE 1,11: PRINT MENU$(0)     'Display menu heading in a box
2000    'Data statements for menu
2010    DATA    Main menu, Add new entries, Amend entries, Full report,
                Summary report, Month-end, Closedown
2020    'Data statements for screen mask
2030    DATA    &HFE1F,&HF01F,0,0,0,&HF01F,&HFE1F,&HFFFF,&HFFFF,&HFFFF,&HFFFF,
                &HFFFF,&HFFFF,&HFFFF,&HFFFF,&HFFFF
2040    'and for cursor mask
2050    DATA    0,&H00C0,&H07C0,&H7FFE,&H07C0,&H07C0,0,0,0,0,0,0,0,0,0,0

5000    'Pull-down menu routine. This should be called repeatedly from
         the program's main loop. It returns the user's selection
         in CHOICE (which is zero if no option has been selected).
5020    CHOICE=0
5040    CALL MOUSE(GET.STATUS,BUTTON,HORIZ,VERT)
                                    'Get button status and pointer position
5060    IF (BUTTON AND 1)<>1 OR NOT FNINHEAD(HORIZ,VERT) THEN RETURN
                                    'Exit unless left button is down and
                                     pointer is in menu heading area
5080    LINE (HEAD.TL.H,HEAD.TL.V)-(MENU.BR.H,MENU.BR.V),BLACK,BF:
        FOR J=0 TO 6: LOCATE J+1,11: PRINT MENU$(J): NEXT J
                                    'Display entire menu (in black)
5100    WHILE (BUTTON AND 1)=1 AND FNINMENU(HORIZ,VERT):
            CALL MOUSE(GET.STATUS,BUTTON,HORIZ,VERT)
5120        CHOICE=VERT\8           'Option currently pointed to
5130        IF PREV>0 AND PREV<>CHOICE THEN
                CALL MOUSE(CURSOR.OFF,X,X,X):
                LINE (MENU.TL.H,PREV*8)-(MENU.BR.H,PREV*8+8),BLACK,BF:
                LOCATE PREV+1,11: PRINT MENU$(PREV)
5135                                'If different from option last time
                                     round, redisplay previous in black
5140        IF PREV<>CHOICE THEN
                LINE (MENU.TL.H,CHOICE*8)-(MENU.BR.H,CHOICE*8+8),WHITE,BF:
                LOCATE CHOICE+1,11: PRINT MENU$(CHOICE):
                CALL MOUSE(CURSOR.ON,X,X,X)
5145                                'Redisplay current option in white
5150        PREV=CHOICE
5160    WEND                        'Repeat while button down and pointer
                                     is in the menu area
5180    IF NOT FNINMENU(HORIZ,VERT) THEN CHOICE=0
5190    CALL MOUSE(CURSOR.OFF,X,X,X):
        LINE (MENU.TL.H,MENU.TL.V+8)-(MENU.BR.H,MENU.BR.V),BLACK,BF:
        CALL MOUSE(CURSOR.ON,X,X,X)
5195                                'Erase entire menu below heading
5200    RETURN
```

(continued from previous page)

appear on-screen. With a graphics screen, you can define any shape that fits into an array of 16 by 16 pixels. In this case, I have used an upward-pointing arrow; the array is represented by the 16 integers in the Data statement in line 2050. If you were to write these values in binary, one beneath another, the 1s would form the shape of the arrow.

Unfortunately, defining the pointer is not quite that easy. Given that each 1 in the bit array represents a white pixel and each 0 a black one, the bit map shown in the listing would give a small white arrow in a larger black box. The whole thing would occupy an area equivalent to four text characters, and would obscure a corresponding portion of the screen.

To get round this, a second array, called a screen mask, is used. The mouse manual says that the driver software Ands this mask with the pixels on the screen, then XOrs the result with the bits in the cursor array. Put another way, a 0 in the screen mask causes the cursor bit to appear as is. When the screen mask bit is 1 and the cursor bit 0, the pixel currently on the screen prevails: the cursor is transparent. When both arrays have a 1 bit set, the screen pixel is inverted. The screen mask in line 2030 of the sample program therefore gives a white arrow with a black edge on a transparent background.

As well as the shape of the cursor, it is also necessary to define its hot spot: the single pixel within the cursor which defines its precise screen co-ordinates. Both the shape of the pointer and the location of its hot spot are notified to the driver by means of function 9 — see line 1140.

If all this sounds a trifle complicated, you can ignore the whole thing and just use the diagonal-arrow default cursor; no special action is needed to specify it. If you do not have a graphics system, you can define the pointer using text characters and attributes instead.

GARBLED

One more housekeeping task is needed before you can use the mouse: you need to actually switch the cursor on. Although the driver keeps track of its position at all times, the cursor must be explicitly made visible — see line 1150. Function 2 switches it on, while function 3 turns it off again. It is a good idea to switch the cursor off temporarily while writing to the screen, otherwise the area underneath it tends to get garbled.

The main part of the program checks the mouse and controls the menus. The key item here is the driver call which gets the current mouse status. This is function 3 in lines 5040 and 5100. It returns the state of the buttons and the co-ordinates of the hot spot.

BUTTON FLAG

The button flag is an integer in which bits 0 and 1 represent the left and right buttons respectively. The bit is set to 1 if the corresponding button is down, 0 if it is up. In fact, many mouse-based packages follow the lead of the Mac by using a single button only, which users tend to find more convenient. As the Apple advertisements put it, when there is only one button it is extremely difficult to press the wrong one. However, on a two-button mouse, the left button is usually the one chosen, and I have followed the practice here.

The other two values returned from the status function are the horizontal and vertical co-ordinates of the cursor. This is a pixel address, location 0,0 being the top-left corner of the screen. The program uses Basic's high-resolution screen mode; if you are using a lower resolution, the same pixel co-ordinates apply and the software rounds them down to an appropriate multiple. For example, in 80-column text mode, all pixel co-ordinates are multiples of 8.

There are a total of 16 functions in the Microsoft mouse driver, although most programs will only use a few of them. Function 12 will be of interest to assembler programmers. It defines a condition mask for an interrupt routine, allowing you, for example, to specify a segment of code to be executed whenever a certain button is pressed. It is not possible to use this in Basic, which is the reason that our menu subroutine needs to be called repeatedly from the program's main loop.

MICKEY UNITS

Other functions permit you to place the cursor at a specified screen location, obtain a count of the number of times a button is pressed in a given period, or measure the physical distance moved by the mouse across the desk. This last value is measured, believe it or not, in units of a Mickey, this being about 1/100 of an inch. You can also alter the Mickey-to-pixel ratio, which could perhaps be useful for someone with a small desk and a steady hand. PC

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BY BEN KNOX

PRESTEL — SIX YEARS ON

Originally designed as an information service, changes have had to be made to accommodate users' desires to communicate.

Prestel is now making a profit — and only six years after it was launched. I am not surprised that it has taken such a long time for Prestel's bank account to crawl into the black; it has only itself to blame. If it was not for such a ridiculous charging structure and marketing strategy, then it could probably have been in a profit-making situation a few years ago.

I had better substantiate my opinions concerning Prestel's ridiculous charging structure and marketing strategy. The last one is easy: when did you last see an advert for Prestel?

As for charges, there are two points to be made. Most important of which is that Prestel has got the public used to very low on-line charges. Anyone setting up a competitive system will have to look forward to at least six years of working at a loss. Good for Prestel, perhaps, but not for the future of communications in Britain.

Secondly, the idea of Closed User Groups is a con. If you join Prestel as a basic user, there is very little information you can access which is of much interest. For many of the more useful areas, you have to pay an extra subscription before you can enter them, then there are frame charges on many frames. Thus you end up paying many times more than the basic Prestel subscription to get all the things you were promised.

A better way would be to have a time charge running constantly which is reduced for off-peak usage and open up the system completely. This will encourage more accesses to more of the system which in turn will enable Prestel to sell advertising space and so reduce charges, gain more users and so on.

Still, the announcement of Prestel's improved finances gives me an excuse to take a look at how Prestel has changed since it started. Apart from the obvious things such as increases in the number of users and information providers, there are other more fundamental areas where the system has changed.

Prestel was originally set up as an information service for people to use from their homes. The equipment required for getting on to Prestel was meant to be either built into or added to television sets. The system would then be used in much the same way as teletext is used now.

Many of the criticisms of Prestel can be answered by looking back to these roots. The low resolution of 40 characters by 25 lines text and 80-by-75 graphics was necessary because television screens could not display high resolution at all clearly. The slow data speed of 75 bits per second was chosen because it was thought that the only data which users would be sending would be page numbers.

Over the last two years, the designers and programmers at Prestel have had to back-pedal from the limitations of the original specification. They had not planned for people wanting to communicate with each other through the system. It is in this field of activity that most of the changes have been made. There are now five services dedicated to user-to-user communications. PC

USER-TO-USER SERVICES

MAILBOX

Mailbox is the service whereby users can send and receive electronic mail. There are none of the facilities which you would find on proper mail systems, such as: a reply option, acknowledgement of receipt of mail, forwarding of mail to another user, mail lists to send one message to a large group of users. Mailbox is just for sending and receiving messages.

CHATLINE

Chatline allows users to chat to each other while on-line. It can be thought of as the Citizen Band of computing. Chatline was Prestel's answer to Compuserve's CB Simulator. Originally Chatline was very slow, it often took as long as half an hour for a message to appear after it had been sent. The reason for the delay was that each message was first taken off Prestel as a mailbox by a BBC Micro, then the message was published as a Prestel page — altogether a very lengthy process. Now Chatline has been automated: all processing is carried out on the Prestel computers. The upgrade means that all messages are displayed within a few seconds of being sent. In turn this has led to another problem: often a message is overwritten before anyone has had a chance to read it. Prestel says this will be sorted out eventually.

One of the advantages of the improved Chatline service is that it allows more than one channel to be active, so there can be different conversations on different channels. Five channels have been set up. Channels 1 and 2 have been designated as General, Channel 3 is for Politics, 4 is for Religion and 5 is the Gayline. It seems that the powers that be have tried to choose subjects that they think will be most controversial, in a hope of knocking up the page access counts as people argue their various viewpoints.

TIMEFAME

The Timefame system could be described as the intelligent person's Chatline. Only quality messages are encouraged. If a user is a nuisance and sends silly messages, he or she is quickly banned from the system. Timefame has the attitude that as it has spent thousands of pounds on its system, it can decide who it would like to use it and what sort of messages they would like on it. Timefame provides areas for the following subjects: Letterbox — general; Phototalk — photography and video; Media — TV, newspapers, films and music; Hobbytime — hobbies; Cityline — finance, stocks and shares, etc.; Tune In — interviews; Ballotbox — voting; Microboard — computers.

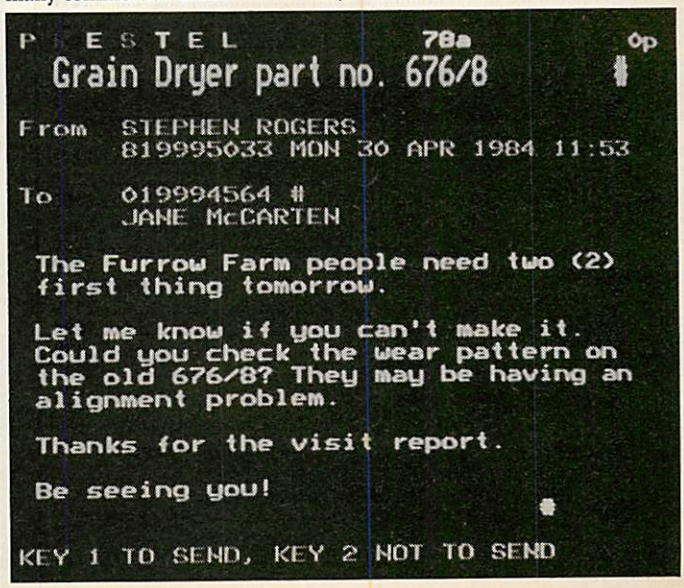
HOMELINK BULLET

The bullet was set up in early 1985 in conjunction with Thames TV's *Computer Buffs* programme. I have an interest in the system, as I did the original design, though my direct involvement ceased some time ago, and many improvements have been made since then. The Bullet provides three facilities for user-to-user communication: a private mailbox for electronic mail, a bulletin board for notices, and a real-time chatting facility. The latter is similar to Chatline, except it uses a different layout. A number of messages are displayed on each page with older messages scrolling off the top of the frame as new messages arrive at the bottom.

GALLERY

The Gallery pages were set up to give Prestel users a chance to try their hand at editing their own database. Originally Gallery editors had to pay about 25p per frame hire charge plus a few pence per update. At these prices hundreds of people decided to have a go. After a month, the interest had obviously waned: many Gallery pages were left for ages without updates. Now, Gallery editors are charged 99p per frame and an update costs around 25p. Perhaps it will deter people from starting databases which they were not going to continue with. Some people's gallery pages were very well written and kept up-to-date. They will not be able to afford to continue, so everyone loses out in the end.

Mailbox's messaging is enough for many commercial users.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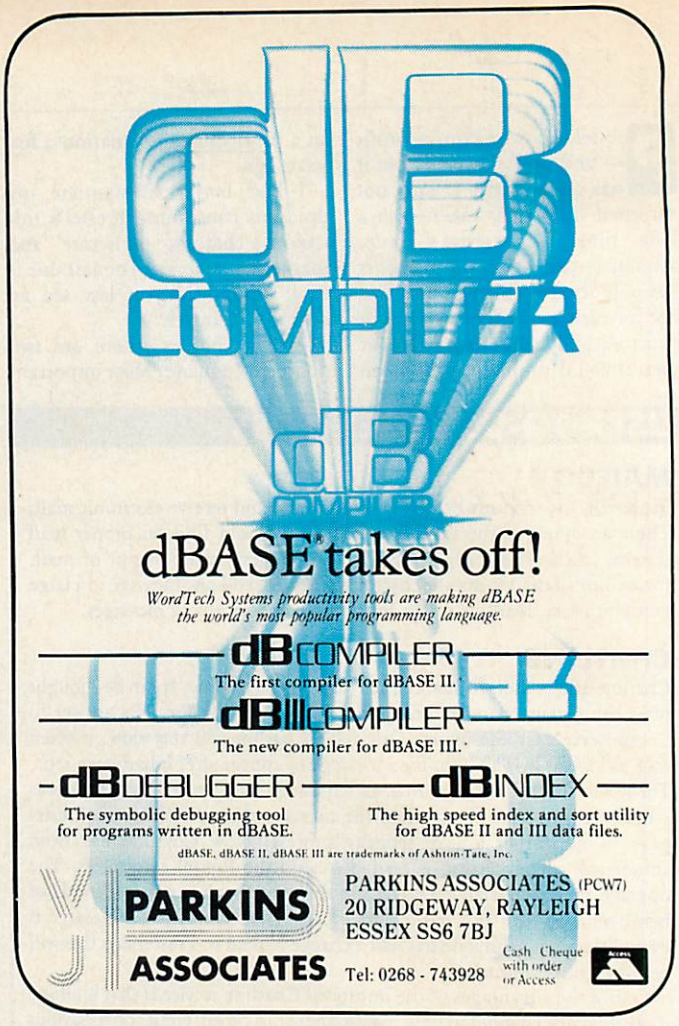
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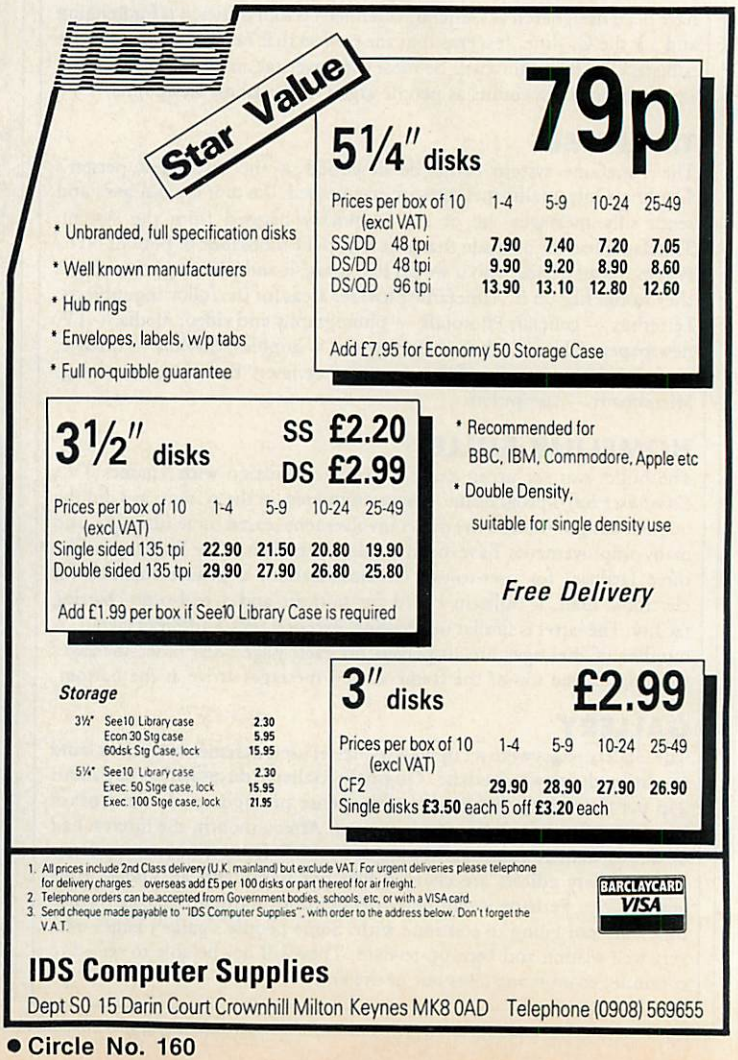
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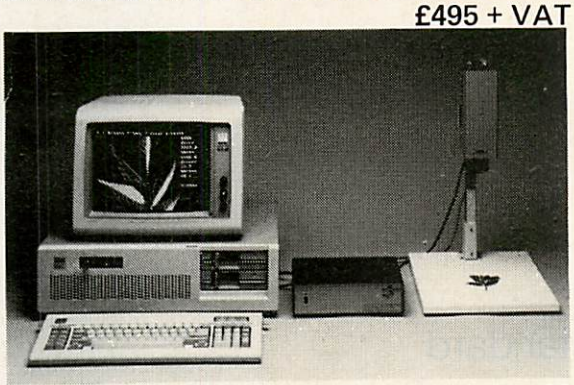

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BY DAVID LEVY

SCRABBLE

How to program this popular word game.

Scrabble combines skill and luck, and can be enjoyed by almost anyone irrespective of their national language or the size of their vocabulary. Players of widely differing abilities can compete on level terms by introducing handicaps, as in golf.

Scrabble is played on a board which comprises a 15-by-15 array of squares, on which some of the squares offer bonus opportunities. The players move in turn, putting down letters so as to form words. At least one of the letters being played in a move must make a new word in conjunction with one or more letters that are already on the board. The letters have point values and making a move which uses all seven letters in a player's rack scores a bonus of 50 points.

DICTIONARY

The size of dictionary that you employ will depend on various factors. The size of your computer's memory is important, as is whether your program will be on cassette, with the whole of the dictionary being loaded into RAM, or on disc. The time taken to search through the dictionary is the critical factor affecting the speed of response of the program, so the programming language you use will also be an important factor. If you are writing in Basic restrict the dictionary size to 2,000 words or fewer, and store the dictionary in a manner that does not require a lot of unravelling. You could use a tree structure or keep all the words of a particular length in an array.

The data structure employed by Schapiro and Smith of the State University of New York at Buffalo to store their dictionary is worthy of consideration — see figure 1. They use a letter table or tree in which each node contains a letter, a list of words, a pointer to the next brother node on the tree, and a pointer to the successor node.

In figure 1 "peck" is the only word in the dictionary contained in the list of all words made up of the letters K, C, P, and E. Whereas "break", "baker" and "brake" are contained in the list of words made up of the letters K, B, R, A and E.

Letters are sorted to determine the next brother node on the basis of three methods of ordering. The most significant factor is the value of the letter in Scrabble. Second is the frequency of the letter in the tiles supplied with the game. Third is the frequency of the letters in English. The order of letters based on these sorting criteria is Q Z X J K H F Y W V C M P B G D L U T N R I O A E S.

If you are writing your Scrabble program in assembler, and have sufficient memory to store a very large dictionary, use a subset of one of the dictionaries compiled specially for Scrabble players or crossword-puzzle solvers, such as the *Official Scrabble Players' Dictionary*.

When planning your program think carefully about your use of graphics. Ideally, you should display the whole of the board, as well as the user's rack of letters, the current score for each player and the number of tiles remaining in the bag. You might display the total thinking time of each player, if you wish to play against your program using time as a scoring criterion.

Another factor to consider is how to deal with dubious words. In a game between humans a player may challenge any word played and if the word is illegal it is disallowed and the player who made it loses their turn. But if the word is found in your reference dictionary it is the player who made the challenge who loses their turn.

You can also make your program more sophisticated by enabling it to learn new words. When it challenges a word that you have played, if you tell the program that the word is legal the program can add it to a dictionary extension which is then dumped back on to disc or tape at the end of the game. In this way the program will expand its vocabulary and make less false challenges.

The first move of the game is easy to program because the word need not intersect with any other words. The strategy for playing Scrabble can be embodied in an evaluation function, and the program searches the board for every possible play, and makes the play for which the evaluation function assigns the greatest number of points. In the simplest case, the evaluation function will be no more than the number of points scored by the play. With more sophistication added to the program the evaluation function will employ more features.

WORD SCORE

One of the most important elements of strategy for much of the game is the Word Score, which is the number of points scored for playing a word, including any bonus points achieved for seven-letter words or for placing letters on bonus squares. Also try not to place a vowel on the squares either side of the central star, because this makes it easy for the opponent to place a consonant — with a relatively high value — on the double-letter squares adjacent to the vowel. Subtract four points for each vowel so placed on the first move.

Try to keep the number of vowels and consonants remaining in your rack evenly balanced. This will increase your options on the next play. When considering a play, the program should compute the difference between the number of vowels remaining and the number of consonants remaining in the rack after this play. A difference of 0 or 1 is ideal, whereas differences of 2, 3, 4, 5 or 6 should be penalised. Penalties could be approximately in the ratio 4:9:16:25:36, though these may be too large.

Holding two or more letters of one type, except the letter S or the blank tiles, restricts your options and should be avoided where possible. Deduct two points for each duplicate, except S and blank, remaining in your rack after a play. If a letter is duplicated more than once deduct four points for the third and subsequent occurrences.

The reason for saving S tiles is obvious. It is easy to create an intersection and hence a place to play a word by creating a plural out of a word already on the board. Deduct three points for each S played. Deduct at least 10 points for playing a word that uses a blank unless all the tiles in the bag have gone. Holding a blank maximises your chances of creating a seven- or eight-letter word later in the game. In addition, your program should be prevented from making any play using one blank unless it scores 50 or more by doing so. It should not use both blanks in one word unless it is a seven-letter word. Neither of these stratagems applies when the bag is empty.

Try to use as many letters as possible at each play; any tiles remaining in your rack after a play are there because you could not use them profitably. If you could not

(continued on next page)

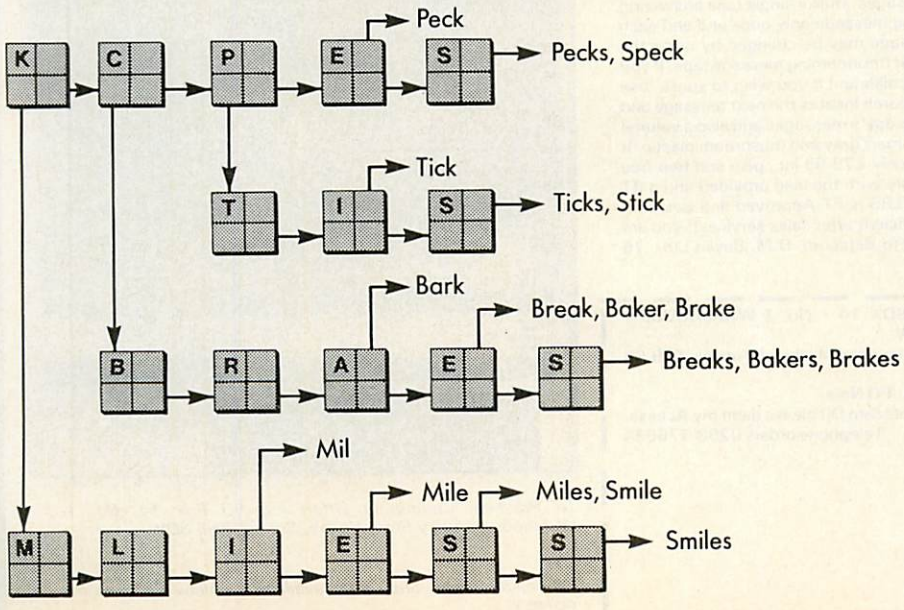

Figure 1. The tree method for storing a dictionary.

(continued from previous page)

use them profitably the chances are that you will not be able to use them profitably on the next play, or the next, and so on. So it is best to get rid of as many tiles as possible. Deduct one point for each letter remaining in your rack after making a play.

The worst thing that can happen to you when the bag is empty or when no more Us remain in the bag is to be left with the Q but no U. So try not to play your last U until the Q is already on the board. You should never play your last U while still holding a Q unless you also hold a blank.

Deduct points for the program playing its last U before the Q appears on the board, as follows: if 75 or more more tiles remain in the bag, and no more than one U is already on the board, deduct three points; if 50 or more tiles remain in the bag, and no more than two Us are already on the board, deduct six points; if 25 or more tiles are still in the bag, and no more than two Us are already on the board, deduct nine points; otherwise deduct 12 points. If the program holds at least one blank the number of points deducted is reduced by two. If the program holds the Q and at least one blank, but no U, it should never play its last blank without simultaneously playing the Q unless the bag is empty, its opponent has just passed and it has no other possible moves.

If the program's rack is full of rubbish, it should pass its turn and throw away all seven tiles, replacing them with fresh tiles from the bag. Exceptions to this are when the program can make a reasonable number of points from a play. If the program cannot make a play worth at least 10 points, and if after making its play its rack corresponds to 10 or more penalty points for duplication, vowel/consonant imbalance,etc, then the program should prefer to pass rather than make a play.

BONUS SCORES

The program should take care not to open up the possibility of double- and triple-letter and word possibilities unnecessarily. A quick opponent will usually take immediate advantage. The closer an empty bonus square is situated to a newly placed tile, the easier it will be for the opponent to take advantage of the situation.

There are three principal things that affect how bad it is to open up a bonus possibility. First, whether a newly created word is at right angles to the direction of the

```
3
2
1
  a b c d e
```

Figure 2.

bonus square — see figure 2 — for example, playing a word on b1, b2 and b3, which would be at right angles to the direction a1, b1, c1, . . ., or whether the bonus square must be reached by playing a word parallel to the newly created word; for example, playing a word on c2, d2, e2, which would be parallel to the direction a1, b1, c1, . . ., or whether the bonus square is reached by extending the newly created word, for example, playing a word on b1, c1, d1, which could be extended by adding a letter at a1. Second, the proximity of a letter in the newly created word to the bonus square. Third, the value of the bonus square.

The formula

bonus square value x A/proximity

provides the number of penalty points that should be deducted from the evaluation function's score for a play, in order to determine whether the play is too risky. Bonus square value is 2 for a double-letter square, 4 for a triple-letter square, 6 for a double-word square and 8 for a triple-word square. A is 4 if the direction to the bonus square is at right angles to the newly created word; 2 if the direction to the bonus square is parallel to the newly created word, or if the the newly created word can be extended to the bonus square by adding S or ES; and 1 in all other cases. Proximity is half the square of the number of empty locations between the newly created word and the bonus square including the bonus square. If seven or more empty squares separate a newly created word from a bonus square, there is no risk and no penalty to be included in the evaluation.

Near the end of the game the players must try to get rid of all their letters, and particularly their high-value letters. The player who first gets rid of all his letters scores twice the value of his opponent's remaining letters. So the bonus for playing each letter should go up to two if the number of letters remaining in the bag after the program replenishes its rack will be three or less. The value of each letter played at this stage of the game should be doubled in the evaluation function, to discourage the program from remaining with any high-value tiles. PC

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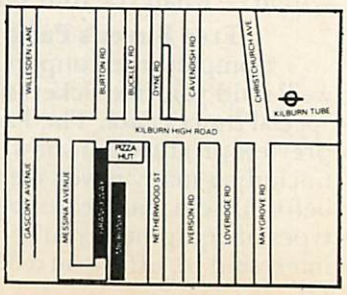

● Circle No. 108

Q Is there an easy way I can make WordStar reformat a whole document? And is there any way I can make it underline spaces between words? The underline function only underlines the words themselves.

D MACDONALD

A WordStar does not have a command to reformat an entire document. Typing ^B reformats the text from the line containing the cursor to the end of the paragraph, unless you have hyphenation switched on in which case it may stop before the end of the paragraph and offer you the option of hyphenating a word which does not fit at the end of a line.

WordStar does have a command ^QQ, or ^Q ^Q, which makes it repeat the command that follows continuously. Thus ^QQ ^B, or ^Q^Q^B, would make it scroll through the document from the line containing the cursor, reformatting each paragraph as it comes to it. It is essential that you turn hyphen-help off before doing this, by typing ^OH, so that it does not stop and offer you the choice of hyphenating words at the end of lines. If necessary, this global command can be stopped by pressing Escape or the space bar.

The trouble with the global reformat command is that it is rather slow. However, the speed can be adjusted by adding a number between 1 and 9 after the ^QQ^B command: entering

^QQ^B1

would make it work fastest.

You may choose to patch the WordStar itself so that hyphen help is turned off by default. You will not then need to type ^OH to turn hyphenation off; typing it in will turn it on again. To patch the program, use the Install or WInstall program; you get to the patcher program by saying modifications are not complete in versions up to 3.0, or by typing + at the main menu in versions 3.3 onwards. Then type the mnemonic

INITWF:+4

for versions up to 3.0 or

:INITWF+4

for versions 3.3 on. This byte should be set to 0 for no hyphenation, or to 0FF to allow hyphenation.

It is worth enquiring why you wish to reformat a whole document. Do you wish to print it with different margins, or a different line spacing, or with a ragged right margin rather than a justified one? It is possible to make Mailmerge reform a document while it is actually printing it. This might, for example, be used to print a document with different margins from those used when the document was originally typed. For example, if the original document was typed with the right margin set at column 65, and you wish to print it with the margin set to column 80, this can be achieved by Mailmerge — but not by WordStar itself — with two dot commands at the beginning of the document:

.PF ON
.RM 80

The first command switches print-time reforming on, and the second sets the right margin to column 80. Similarly Mailmerge may be used to change the line spacing throughout the document. If the original document was typed in single spacing, and you wish to print it double spaced, this can be achieved by:

.PF ON
.LS 2

Finally, Mailmerge may be used to change the justification throughout the document. If the original document was typed with right justification on and you wish to print with justification off — that is, with a ragged margin — this can be achieved by:

.PF ON
.OJ OFF

You could do all three changes in one go with four dot commands:

.PF ON
.RM 80
.LS 2
.0J OFF

The normal way to make WordStar underline text is to put ^PS before the first letter to be underlined, and another ^PS after the last letter to be underlined. This special print feature does not underline the spaces between the words, which does spoil the look of headings. To make WordStar underline both words and spaces use the underlining feature as usual, but also type the underline character rather than a space between words.

WordStar treats the underline character as a letter, and so the underlined text is considered as one large word. This has several interesting consequences. First, you cannot move the cursor one word at a time along the underlined part using ^F and ^A. However, you can still move the cursor one character at a time right or left with ^D or ^S.

Secondly, if part of a line of text is underlined in this way, then the spacing between the non-underlined words on the line may be bigger than usual if the text is right-justified. This becomes noticeable when WordStar has to add a lot of spaces to pad the line. Finally, it is possible that the large underlined part that is treated as one word will not fit on to a line, and WordStar will not know what to do about it. You can easily remedy this by changing an underline character to a space at a suitable place in the line, so that WordStar can fit part of the underlined piece on one line, and part on the next line.

CP/M DISC DISASTER

Q Is there any way of recovering a CP/M file which has been erased by accident? Also what, if anything can be done with a disc that just gives the dreaded message

BDOS ERROR ON B:

but will not list the directory or read at all on the machine that produced it?

R MORGAN

A Information is stored on a floppy disc in a series of concentric tracks, usually 35, 40 or 80 tracks on one or both sides of the disc. Each track is subdivided into a number of sectors, each sector being an arc. A disc can become damaged physically because oxide has flaked off or the surface has been scratched or marked by fingerprint marks. It can also be damaged electrically by spurious signals or electrostatic discharge. In either case the result is one or more corrupted sectors.

A corrupted sector could be in an existing file, in the directory which stores the names and locations of all the files on a disc, or in a part of the disc that has not yet been used. CP/M has all manner of protective devices to stop you reading corrupt data, and this is where the dreaded message

BDOS ERROR ON B:

comes from. If the corrupt sector is in an existing file, CP/M will not allow you to read that file beyond the corrupt sector. If the corruption is in the directory, CP/M will not allow you to read the directory beyond the corrupt sector. If the corruption is on some unused part of the disc, when you try to write a file on that part CP/M will not allow you to close the file.

We have used a CP/M program called Disk Doctor on the few occasions when we have had to recover from these problems. It costs £70, and further information on it can be obtained in the U.K. from Digital Devices Ltd, 134 London Road, Southborough, Tunbridge Wells, Kent TN4 0PL. MS-DOS and PC-DOS versions of the program are also available.

Disk Doctor can copy a corrupt disc on to a new disc, copying valid sectors correctly and replacing corrupt sectors by blank characters. This enables most of the copied disc to be read and used normally, but the file that previously had the corrupt sector will now have a blank part. If the corrupt sector was in the directory, four file entries will be lost for each corrupt sector but the rest will be usable. It is also possible to copy specified sectors or tracks, though piecing them back together into their original files is difficult.

When you type

ERA filename

under CP/M, you do not erase the file from the disc, but simply mark its directory entry as erased. Both directory entry and file remain until you subsequently write to the disc and overwrite them. Disk Doctor can read the directory, tell you the names of any erased files and allow you to Unerase a named file.

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Q I have a Qume Sprint 7/45 daisywheel printer with a 13-bit parallel interface output via a 50-way edge connector, and I wish to link it to a BBC model B computer. Can you explain the problems? The only glimmer of hope came from a firm offering a parallel-to-serial adaptor at about £250, which is not economically viable. Any suggestions?

B R COBB

A The BBC Micro has both serial and parallel output sockets. Most people use the parallel port to connect printers because many popular

(continued on next page)

(continued from previous page)
units are cheaper with a parallel interface than with a serial interface; the serial type needs extra electronics, including a Uart.

To connect your Qume, with its parallel input, you might think that all you need is a suitable parallel cable made with the right plugs at either end. However, there is a problem: parallel interfaces are not standardised, and parallel printers come in at least half a dozen different types. The most common ones are: the Centronics interface, which uses 10 parallel signal lines to handle communications between the printer and the computer; the Diablo interface Hitype 1 which has 22 signal lines, and the newer Hitype 2 version which has 24 signal lines; and the Qume interface, which has 16 signal lines.

Because your computer has a Centronics interface, and your printer a Qume type, there is no easy way to connect them. The solution is to use the BBC Micro's serial port and a serial to parallel convertor, which may then be connectd to the Qume parallel port. One serial to parallel convertor that we know of is the S1 model from Aculab Ltd; it costs £66 plus VAT. Aculab is at Unit A, Station Approach, Leighton Buzzard, Bedfordshire LU7 7LY. An alternative unit is available for £75 plus VAT from Micro General, Unit 25, Horseshoe Park, Pangbourne, Reading RG8 7JW.

Instead of the serial to parallel convertor you could use a printer buffer. The main purpose of these devices is to allow the computer to transmit a file rapidly to the buffer while the buffer retransmits it slowly to the printer. In this way you do not have to wait for the file to finish printing before you can use the computer. Buffers can be obtained with any combination of serial or parallel input and output, so you could use one both as a buffer and also to change from serial to parallel. An 8K buffer costing only £85 plus VAT can be obtained from AMA Computer Supplies, Dept B, 8 Glebe St, Beeston, Nottingham NG9 1BZ.

We have not checked what sort of parallel port is provided on any of these units. As we have explained, it must match your printer.

Q **I was very interested in the program Polynomial on page 134-5 of last May's *Practical Computing*. This would be useful for solving serious engineering problems. Are there likely to be problems translating it from BBC Basic for use on an IBM PC? Is GWBasic a suitable language for this? Please have you any advice.**

J MACPHERSON

A The problem of finding where a polynomial curve cuts the axes or the solutions to an equation of the kind

$y = a + bx + cx^2 + dx^3 \ldots$

is particularly difficult, and has taxed the brains of mathematicians through the ages. It is not hard to get answers; what is difficult is getting reliable answers. The problem is made worse if the calculations are performed using only a limited number of significant figures, and the magnitude of the (x,y) graph points also affects reliability. The system is ill-conditioned, which means that very small changes in the input data may produce very large changes in the coefficients obtained.

The Polynomial program you refer to is very limited. It is written in machine-specific BBC Basic, using both graphics and procedures not available in other Basics. It is restricted to a maximum of 12 graph points, and the method used in the calculation is not particularly accurate. BBC Basic carries nine decimal-figure accuracy, which is better than many but not really enough for this purpose. No attempt is made to scale the data, so the size of the (x,y) values affects the accuracy of the coefficients. We would not advise you to spend time converting this program to a more standard form of Basic for an IBM PC or one of its clones. It would be even less accurate if run under Basica or GWBasic on 16-bit machines, or MBasic on eight-bit machines because Microsoft Basic carries only six significant figures.

Line 1530 of the program calculates a term x^5. If x is 10, x^5 is 100,000 which can be stored in six significant figures. However, if x is 100, x^5 is 10,000,000,000 and if only six significant figures are stored then this result will be indistinguishable from 100.0001^5. Plainly the problem becomes worse as x gets larger.

You may think that you could cure this problem by using double-precision variables throughout. In Microsoft Basic, double-precision terms carry 16 significant figures. This does not cure the problem, since unknown to you x^5 is evaluated using the log function; the Microsoft Basic interpreter only evaluates functions in single precision, so though you will get 16 figures printed out the answer has been rounded in middle of the calculation. The Microsoft Basic compiler does not have this problem.

If you want to use Basic, either use the Microsoft compiler in double precision, or get a different version Basic such as Micromike's Bazic, available in eight, 10, 12 and 14 significant-figure accuracy versions, or XBasic written by Xitan and available through the Byte Shop/Computerland chain. Both work in binary-coded decimal rather than true binary.

Alternatively, use a different language such as Fortran. Finally a Basic program that is written in a simple subset of Basic for portability and that can handle 100 graph points, scales the data to increase accuracy, and that uses the powerful Forsythe method, can be found in chapter 9 of the book *Statistics and Computer Methods in Basic* by J D Lee and T D Lee, published by Van Nostrand Reinhold. We make no apology for the commercial: we would not rely purely on the accuracy of answers obtained with the program published in Open File.

Q **I have installed WordStar for a Qume Sprint daisywheel, but have come up against a problem while installing it for a Daisystep 2000. I use a 12-pitch daisywheel more often than not, and would like to alter the standard pitch setting to avoid having to put .CW10 in every document. I have tried to do this without success using the Custom Installation of Printer section of the Install program, with the Q option for character pitch. My printer manual gives an example of doing this using the Esc sequence table with**

,1B ,1F, 0B

for 12-pitch. I have tried putting this code in every possible way, without any luck. I am stuck as to what to do now.

BRIAN POGSON

A First a warning! When modifying bytes in a machine-code program, an accident could ruin your copy of WordStar. This could be expensive, so make sure you are working on a backup copy. Run the Install.Com or WInstall.Com program, and get to the patcher routine so that you can modify bytes in the user area of the program. To do this with WordStar version 3.0 or below, reply No to the question "are the modifications to WordStar now complete?" With WordStar versions 3.2 and later, instead of typing a letter to select one of the menus, or to exit from Install, type a + to get the patcher.

You will be asked

LOCATION TO BE CHANGED (0=END)

The default value for the standard print width is stored at location InitPF: + 16. On WordStar versions 3.2 and later, type a colon then the mnemonic name

:INITPF+16

and press Return; on earlier versions of WordStar, type the colon after the name, that is

INITPF:+16

The current value of this byte will be displayed, and this will be 0C hex, 12 decimal. The default character width is the same as the command .CW12, which gives a spacing of 120/12, or 10 characters per inch. You want to change this byte to give the same effect as the command .CW10, so that you obtain a spacing of 12 characters per inch by default. Decimal 10 is 0A hex, so you simply type the new hex value, 0A, and press Return. This takes you on to the next byte, which is the alternate character width, and you may care to change this to give 10 characters per inch. When you have made the required changes, just type 0 to leave the patcher routine.

Your method of patching the Character Pitch directly should also work, though we have not tried it. However, you should remember that the first byte in WordStar printer-control sequences specifies the number of bytes to be sent to the printer. Thus to send

1B 1F 0B

to the printer, WordStar expects the sequence

03 1B 1F 0B

which can probably be entered through the installation program as

,03 ,1B ,1F ,0B PC

In "Ask PC" **John and Timothy Lee** answer questions on any area of microcomputing. If you have a nagging problem, write to us, marking ASK PC clearly on the top left-hand corner of the envelope. Letters should contain one question only. We cannot guarantee a personal reply, but to be considered your letter must include your name and address, together with a stamped addressed envelope. The most representative questions of general interest will be answered and published.

ATARI ST

520ST

POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazingly high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 18 key numeric keypad), MIDI interface, GEM and a 500K 3½ inch disk drive, all for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizeable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below: 1) TOS -Tramiel Operating System based on CPM 68K. 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment. 3) DR GEM Paint for creating graphics masterpieces. 4) DR GEM Write for word processing. 5) Logo learning language to enable you to write your own programs easily using turtle graphics. 6) DR Personal Basic a powerful user friendly version of the Basic programming language. 7) BOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned. Atari will soon be releasing a 1000K (1MB) 3½ inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disk (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

Silica Shop Price: £651.30 + £97.70 VAT = £749.00 This price includes:

- ★512K RAM
- ★B/W MONITOR
- ★MOUSE
- ★500K 3.5" DISK DRIVE
- ★GEM
- ★KEYBOARD (95 KEYS)

£749

ATARI 520ST SPECIFICATION

MEMORY
512K RAM (524,288 bytes)
16K ROM expandable to 320K
Port for addnl 128K plug-in ROM cartridges
200K TOS operating system

GRAPHICS
Individually addressable 32K bit-mapped screen with 3 screen graphics modes:
320x200 pixels in 16 colours (low resolution)
640x200 pixels in 4 colours (med resolution)
640x400 pixels in monochrome (high res)
16 shades of grey in low res mode
512 colours available in low/medium res
8 levels of each in red, green and blue

ARCHITECTURE
4 custom designed chips:
GLUE Chip - MMU Memory Mngmnt Unit
DMA Controller - Graphics Processing Unit
16/32 bit Motorola 68000 processor at 8MHz
eight 32 bit data registers
eight 32 bit address registers
16 bit data bus/24 bit address bus
7 levels of interrupts/56 instructions
14 addressing modes/5 data types

DATA STORAGE
High speed hard disk interface
Direct memory access 1.33 Mbytes per second
CD (Compact Disc) interface
Built in cartridge access
Dedicated floppy disk controller

DISK DRIVE
500K (unformatted) s/sided 3½" floppy d/drive
349K (formatted) storage capacity

SOUND AND MUSIC
Sound Generator
Frequency control from 30Hz to above audible
3 voices (channels) in wave shaping sound in addition to a noise generator
Separate frequency and volume controls
Dynamic envelope controls
ADSR (Attack, Decay, Sustain, Release)
Noise generator
MIDI interface for external music synthesizers

KEYBOARD
Separate keyboard microprocessor
Standard QWERTY typewriter styling
Ergonomic angle and height
95 keys including 10 function keys
Numeric keypad — 18 keys including ENTER
One touch cursor control keypad

MONITOR
12" screen - high res monochrome monitor
640x400 monochrome resolution

VIDEO PORTS
Display - Low Resolution - 40 columns
Med/High Res - 40/80 plus cols
Medium res RGB (Red/Green/Blue) output
High resolution monochrome (Black & White)

COMMUNICATIONS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT52 Terminal Emulation Software
Maximum Baud Rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 2 button mouse)
MIDI interface for external music synthesizers

GEM WIMP ENVIRONMENT
WIMP - Window Icon Mouse Pop-down menus
Two button mouse controller
Icons/Pull down menus/Windows
GEM VDI - Virtual Device Interface
GEM AES - Application Environment Services
GEM BBT - Bit Block Transfer
Real time clock & calendar

SOFTWARE
GEM environment
with user friendly Macintosh style operation
'TOS' - Tramiel Operating System
Atari's own system based on CP/M 68K with hierarchical directory & file structure plus a host of MS DOS & UNIX command structures
'BOS' - Business Operating System
to run any standard BOS business programs
GEM desktop
with GEM PAINT graphics mgmt system and GEM WRITE word processor
Personal BASIC and DR Logo
originally written by Digital Research (DR) Very much like those on other machines except for the extensive use of pull down menus, mouse control and windows

VARIOUS
Dimensions: 470mmx240mmx60mm
Replaceable external power supplies
Expansion: 3½" floppy disk drives 500K/1,000K (two drives can be connected)
3½" 15Mb hard disk
CD (compact laser disc)
Dot matrix & d/wheel prntrs (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

LANGUAGES
BASIC & LOGO supplied
Many others will soon be available, including: Assembler, BCPL, C, Cobol, Compiled Basic Lisp, Modular-2 and Pascal

Note: Some of the above specifications are pre-release and may therefore be subject to change

MACINTOSH v F1e v 520ST

"Imagine a Fat Mac - the 512K Apple Macintosh - but with a bigger screen, a far bigger keyboard with numeric keypad, cursor and function keys, and colour. That gives you some idea of what the Atari 520ST is like, except for two important things. First the Atari seems faster. Second the Atari system is about one third of the price."
June 1985 - Jack Schofield - **PRACTICAL COMPUTING**

	APPLE	APRICOT	ATARI
FEATURES OF BASIC SYSTEM	**MACINTOSH**	**F1e**	**520ST**
Price Includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (LxDxH)	330x147x50	450x167x28	470x240x60
Keyboard size ins (LxDxH)	13x5⅞x2	17½x6½x1	18½x9½x2½
3½" D/Drive (Unformatted)	500K	500K	500K
3½" D/Drive (Formatted)	399K	315K	349K
WIMP (Window, Icon, Mouse ...)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232 Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	59	92	95
Numeric Keypad	NO	YES (16 Keys)	YES (18 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	10
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	16	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse included	Single Button	NO - extra £95	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Joystick Ports	NO	NO	YES (two)
MIDI Synthesiser Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES

System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive

Price of basic system (exc VAT)	£2595+VAT	£595+VAT	£652+VAT
+ Mouse	Included	£95+VAT	Included
+ Monochrome Monitor	Included	£200+VAT	Included
+ Expansion to 512K RAM	Included	£295+VAT	Included
Price of complete system (exc VAT)	£2595+VAT	£1185+VAT	£652+VAT
PRICE rounded down including VAT	**£2,984**	**£1,362**	**£749**

PRESS COMMENT

"Atari's new corporate image as an aggressive low cost computer maker is likely to mirror that of Commodore where Mr. Tramiel established the maxim that 'Business is war'."
August 21st 1984 **FINANCIAL TIMES**

"This is the only personal computer I know of that comes with a Midi interface as standard."
Peter Bright March 1985 **PERSONAL COMPUTER WORLD**

"The (GEM) version running on the Atari 68000 machines will have the additional advantage of leaving the PC version standing."
April 6th 1985 **PERSONAL COMPUTER NEWS**

"It would seem that GEM offers the ideal operating system."
March 7th 1985 **POPULAR COMPUTING WEEKLY**

"I found it (GEM) extremely easy to use and was very impressed with the way in which it disguises the unfriendly hardware and operating systems lurking under the surface."
Peter Bright Feb 1985 **PERSONAL COMPUTER WORLD**

"The electronics in the machine are a work of art ... The heart of the 520ST is a Motorola 68000, one of the most powerful 16-bit processors around and in many respects it is close to being a 32-bit chip ... when the machine appears in the shops, I'll be at the front end of the queue to buy one."
Peter Bright June 1985 **PERSONAL COMPUTER WORLD**

"This machine is significantly more powerful than an IBM PC ... If it's possible to design a sure-fire winning machine, this is it."
May 11th 1985 **PERSONAL COMPUTER NEWS**

"... the use of GEM makes the new range of Atari computers so similar to the Macintosh (with the added attraction of colour), that they are already being called 'Jackintoshes'."
May 2nd 1985 **COMPUTING**

"The new Atari ST computers truly represent to the consumer what Jack Tramiel is saying — easy-to-use computing power without the price."
March 1985 **ANALOG COMPUTING**

"It (the ST) uses the most modern technology that is affordable, in a package that gives a professional impression."
May 23rd 1985 **POPULAR COMPUTING WEEKLY**

"The Atari ST is one of the most elegant designs I have seen ... Atari has used an original and elegant method of memory management which should make the ST faster than any other PC on the market - in any price bracket ... The 64K dollar question is would I go out and spend money for one? To which the only answer is 'Try and stop me!'"
John Lambert July 1985 **ELECTRONICS & COMPUTING**

"The 520ST is technically excellent ... The 520ST hardware is the new standard by which others will be judged."
July 1985 **YOUR COMPUTER**

SILICA SHOP

WE ARE THE UK's No1 ATARI SPECIALISTS

At Silica we have been successfully dedicated to Atari ever since their products first appeared on the UK market. We can attribute our success largely to the Atari specialisation which we practice and to the user back-up we provide. Rest assured that when you buy a piece of Atari hardware at Silica you will be fully supported. Our mailings giving news of software releases and developments will keep you up to date with the Atari market and our technical support team and sales staff are at the end of the telephone line to deal with your problems and supply your every need. With our specialist bias, we aim to keep stocks of all the available Atari hardware, software, peripherals and accessories. We also stock a wide range of Atari dedicated books and through us, the owners on our list can subscribe to several American Atari dedicated magazines. We can provide a full service to all Atari owners and are now firmly established as the UK's NUMBER ONE Atari specialists. Here are just some of the things we can offer to our customers.

- ★ FREE POST & PACKING ON MAIL ORDERS
- ★ FREE NEXT DAY SECURICOR DELIVERY
- ★ INFORMATION MAILING SERVICE
- ★ TECHNICAL SUPPORT TEAM
- ★ HIGHLY COMPETITIVE PRICES
- ★ AFTER SALES SUPPORT SERVICE
- ★ REPAIR SERVICE ON ATARI PRODUCTS

If you would like to be registered on our mailing list as an Atari computer owner, or as a person interested in buying an Atari machine, let us know. We will be pleased to keep you up to date with new Atari developments free of charge. So, return the coupon today and begin experiencing a specialist Atari service that is second to none.

SILICA HOTLINE 01-309 1111

SILICA SHOP LTD, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

SEND FOR FREE ATARI ST LITERATURE

To: Silica Shop Ltd, Dept PC 01/85, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

PLEASE SEND ME FREE LITERATURE
ON THE NEW ATARI 520ST COMPUTER

Mr/Mrs/Ms: ..... Initials: ..... Surname: .....

Address: .....

.....

.....

.....

Postcode: .....

Do you already own a computer
If so, which one do you own? .....

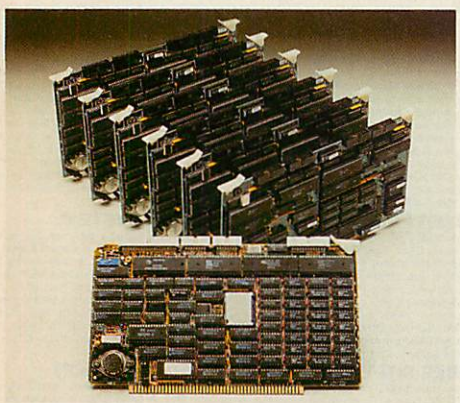
● Circle No. 109

More muscle.

THE NEW MINSTREL 4
MULTI-USER NETWORKING IN STYLE

The designers of Minstrel 4 were given a simple brief: produce a world-beating, cost-effective and practical multi-user system.

And do it with style.

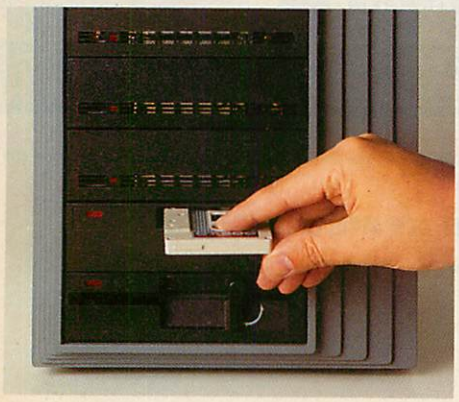


Minstrel power – 80186 master and HTS 186 dual processor slaves.

They passed the latter test with flying colours. But looks aren't everything. Inside this beautifully engineered chassis, you'll find a close coupled TurboDOS† network that holds the key to all your multi-user computer projects.

Now, and for the future.

Minstrel 4 is a multiprocessor machine – every user of the system gets a DEDICATED CPU and 512 Kb RAM. This virtually eliminates the response time degradation you often find on timeshare minicomputers and so-called supermicros.



Minstrel design – fast tape back-up for safety and convenience.

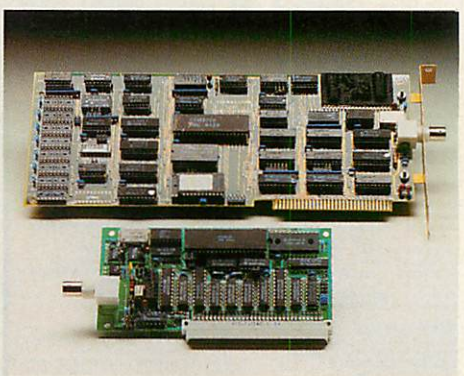
Minstrel 4 is more powerful than most minis, even in its most basic state. You can start with two users, but a full blown 16 user system will give you 9 MBytes dynamic RAM and 17 CPUs with 80186 instruction sets, running concurrently at 8 MHz. With that sort of power, we're confident that you won't run out of steam.

Minstrel workstations – come complete with function keys and business graphics potential.

Minstrel 4 has unprecedented networking capability. The Winchester controller has built in ARCnet. You can network IBM PCs, ATs, Apricots, Olivettis and all lookalikes if required. Gateways to IBM and ICL mainframes are available. Most important, you can network Minstrel 4s together – 256 of them to be precise.

Minstrel 4 supports CP/M, MP/M, MS DOS (including version 3.1 with file and record locking) and has PC DOS emulation, so you can run nearly all the popular business packages.

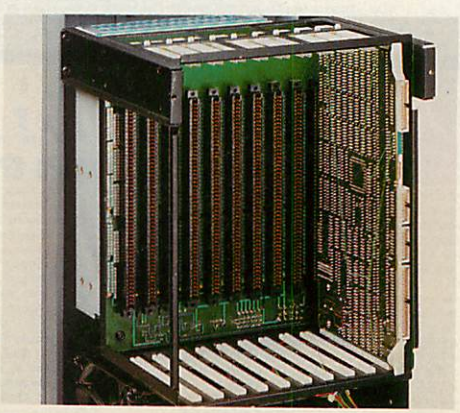
Storage capacity is only limited by your budget. A single Minstrel 4 holds up to 160 MBytes formatted disk capacity, with onboard streaming back-up of up to 60 MBytes. Direct memory access means you can download 20 MBytes onto tape in less than 4 minutes. Higher capacity drives can be supplied.



You can even network stand-alones into the Minstrel System, using Minstrel ARC net cards.

A two user Minstrel 4 system, complete with tape back-up and terminals will cost you less than £7,000. Additional workstations, just over £1,000 per user, a price/performance package you'll find unbeatable.

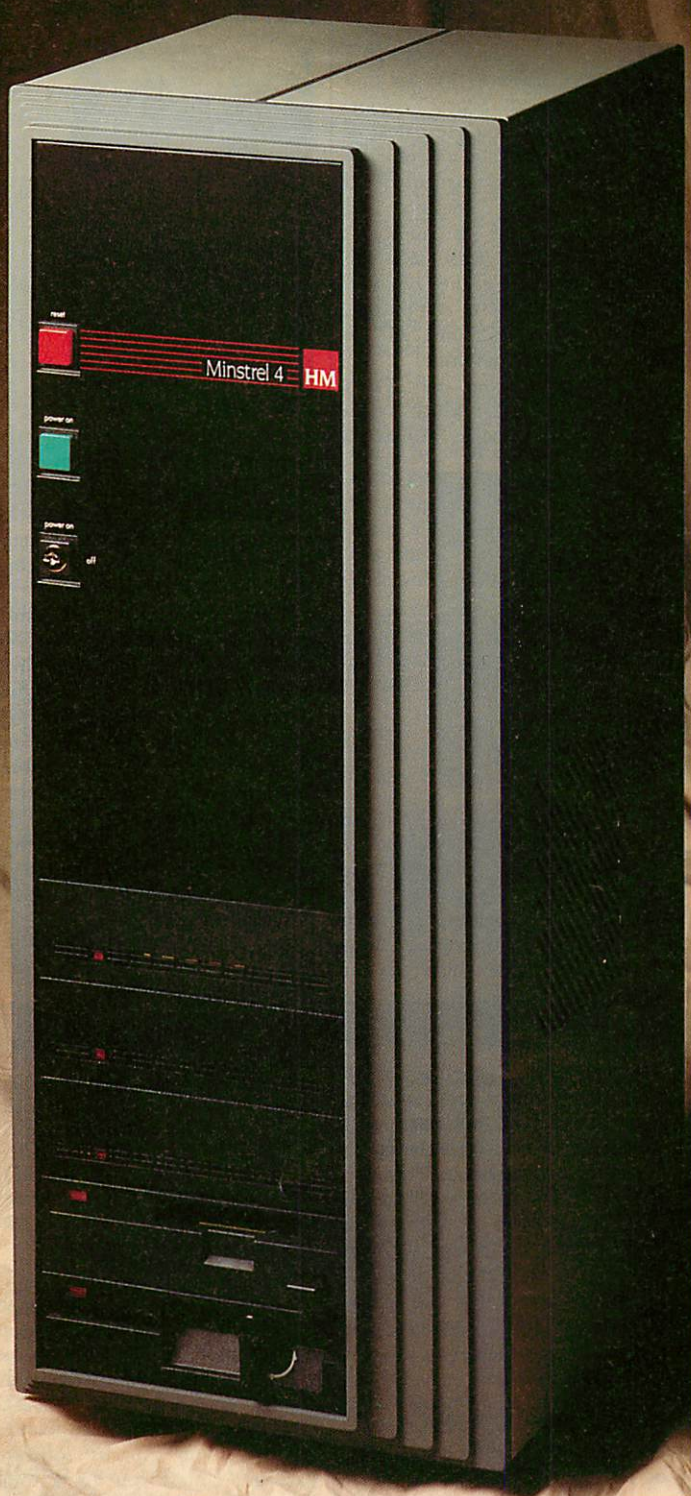
At last there is a serious alternative to the minicomputer, with the sort of costs and flexibility you'd associate with a micro. It's called Minstrel 4, and you should find out more about it. Write or call us for details.



With Minstrel, expansion is integral, not an afterthought.

● Circle No. 110

Better shape.



†TurboDOS™
Registered trademark of Software 2000 Inc.

IBM/PC is a trademark of International Business Machines Inc.
Apricot is a trademark of Apricot plc.
MS DOS is a trademark of Microsoft.

HM Systems

HM Systems Limited, 220 The Vale, London NW11 8HZ
Telephone: (01) 209-0911 Telex: 266828-HMS G Easylink: 19001060

It Reads, Writes and It Paints in 3-D, Keeps and Talks to

It's called "OPEN ACCESS," and it's the result of 60 man-years of effort to create a truly do-it-all, super-program—one that can perform virtually every task you're ever likely to encounter.

The beauty of it is, all that capability resides on a single program. You don't have to re-enter data. Or spend time trying to get unmatched programs to work together.

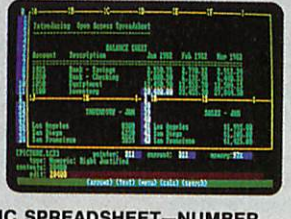
OPEN ACCESS takes its name from the source of its power—a relational data-base manager that gives you access to more data in more ways than any comparable software.

OPEN ACCESS includes an electronic spreadsheet, 3-D graphics, word processor, appointment scheduler and telecommunications module—all revolving around the powerful information manager.

1

INFORMATION MANAGEMENT—THE MASTERMIND. This advanced data-base manager stores and retrieves multiple files quickly, easily and reliably. What's more, it shares all information with the other programs, so you never have to re-enter the same data twice.

2

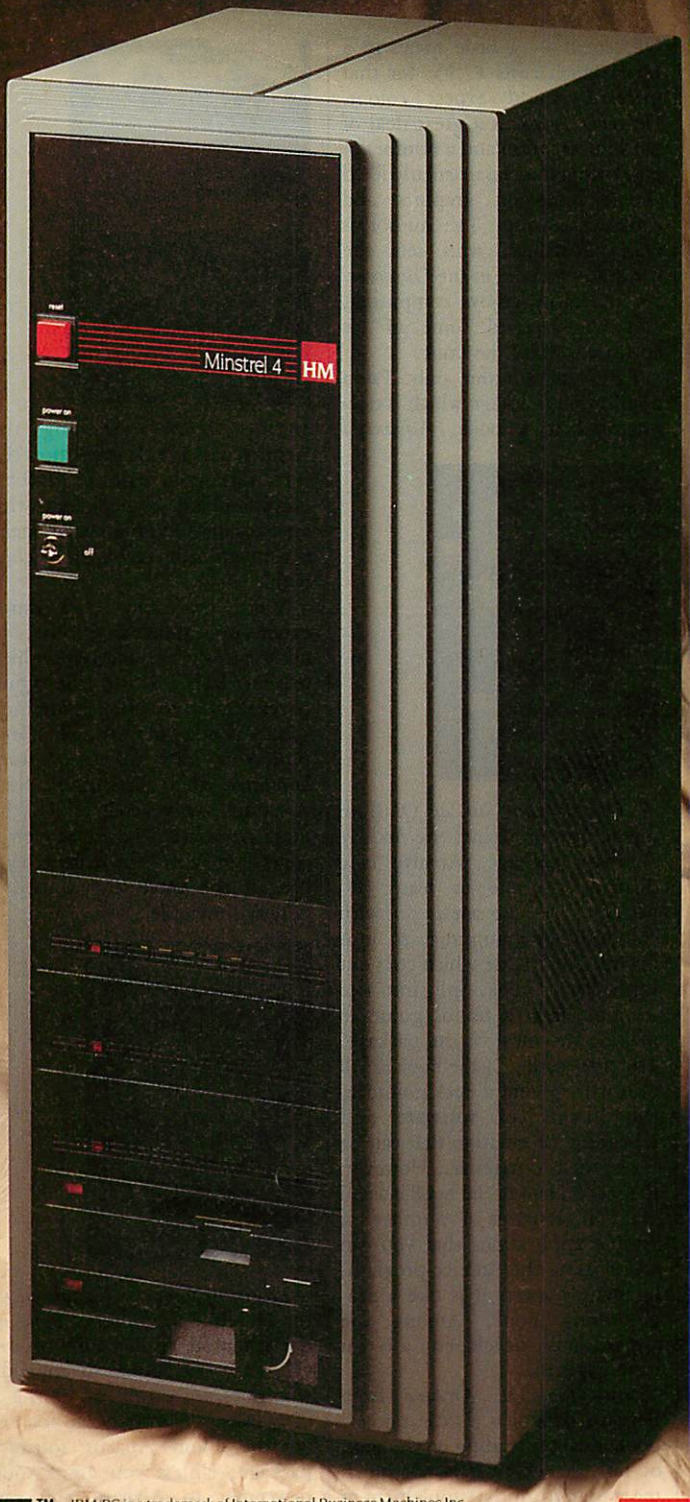


ELECTRONIC SPREADSHEET—NUMBER CRUNCHING AND GOAL SEEKING. It helps you produce forecasts, cost estimates and "break-even" points—in seconds, instead of hours or days. Best of all, it allows "goal seeking." Ask, for example, "What sales must I have the rest of the year to net $1 million?," and OPEN ACCESS will figure it out!

3

3-D GRAPHICS—NOT JUST PRETTY PICTURES. These graphics distill raw data into trends that can be instantly visualized, helping you discern the important facts from a wealth of information.

Better shape.



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BOOK REVIEWS

COVERING THE QL

Bill Bennett discovers that the QL's disappointing sales have not dampened the enthusiasm of the book publishers.

WHEN the QL was first launched, the computer book industry went mad. Book after book appeared with the magic letters "QL" in the title. Many of them hit the bookstands before the QL hit the shops. To my personal knowledge a number of these books were written by authors who had not, at that stage, even seen a QL, just a pre-release version of the manual. Many of the early QL books were filled with errors and, not surprisingly, they did not sell very well.

Considering how few QLs have come into circulation since then, there is a disproportionately large number of books available. On the whole, the quality is higher than, say, the quality of books about the Commodore 64, but they are a lot less imaginative in content. Many of the books in this survey cover the same ground: how to make the most of the bundled applications packages, how to write SuperBasic or machine-code programs and so on. Very few have original ideas. This could be said to have something to do with the computer market maturing, but it looks more like that they have run out of ideas.

Using Graphics on the Sinclair QL published by Hutchinson is one of the Sinclair QL series of books. It deals with both graphics programming using SuperBasic, and the use of Psion's Easel program which comes bundled with the QL. The book is illustrated with a number of monochrome photographs of the QL screen — a little mean in a book which costs £7.95; for that price I would expect colour. However, there is a great deal of hard information and a number of good programs. I particularly liked the chapter on graphics and problem solving. The author is Garry Marshall, who sets the computer puzzles in the *Observer*. He obviously enjoys computing, and has injected some of his enthusiasm into the book.

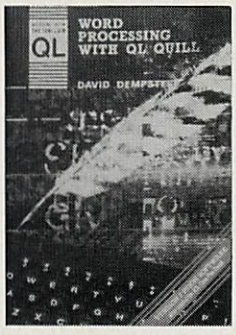
Easel is not the only Psion applications package which is documented in a book. *Advanced*

Archive on your Sinclair QL from Sigma Press examines the Archive database package. Archive is a difficult package to learn, especially if you are not *au fait* with computer programming, so it is one area of QL use which cries out for a decent book. Split into two sections, it is a useful guide to making the most of the package. The first section of the book is full of waffle, giving a background to the history of software and repeating information that can be found in the manuals. However, the second half of the book is a real gem. It contains a number of sample applications that you can create using the Archive program; in many respects it is like a programming book. Among the applications developed are an expert system.

Into the QL Archive from Bernard Babani is a little pocket-book ideal for reading on the train or bus. At £2.50 it is not much more than a tutorial supplement to the manual, together with some simple applications. *Database Management on the Sinclair QL* in the Hutchinson QL series is

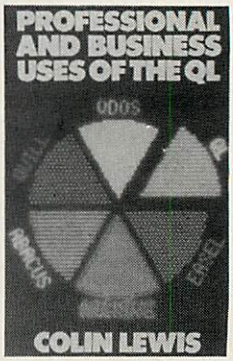
another book examining the Archive package. It introduces the topic through a series of practical examples and is peppered with screen shots and programs to make a difficult subject easier to cope with.

Word processing is a much easier application for QL users to get to grips with, so a book which teaches how to use the Quill package has to offer something special if it is going to sell. *Word Processing with QL Quill* from Longman does not manage this. Although the cover is one of the most attractive I have seen on a computer book, the writing style has all the verve and wit of a railway timetable.



Profiting from the Sinclair QL in the Hutchinson QL series looks at the financial applications of the QL, and will appeal to anybody who does not think "profit" is a dirty word. Naturally, it focuses on the Psion Abacus software package. Unless you are a total newcomer to Abacus, you can ignore most of the book — it will not tell you much that you cannot glean from the manual. However, there is a useful chapter on applications. Like the rest of the Hutchinson Sinclair QL series, it is comprehensive, and illustrated throughout with screen shots. Any computer book which manages to include cricket in its pages will always find a place in my library, even if the cricket-averages calculation is not a very good example of a financial application.

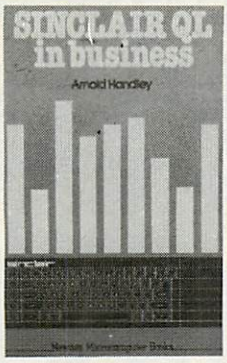
Professional and Business Uses of the QL from Collins attempts to cover all four of the bundled QL application packages. Obviously it cannot go into as much detail as the books which examine separate applications packages. It is designed to appeal to users who do not have the time to learn programming, but want to use the packages effectively. I applaud the aim of this book. It has stripped down the knowledge to the bare minimum, it assumes the user knows nothing, and all the programs have been tested and printed directly from an Epson printer. Like almost all the other QL books it costs £7.95. I get the impression that the computer book publishers met around a huge table, OPEC-like, and decided that QL books, whatever the quality or content, should cost £7.95.



Using your Sinclair QL from Hodder and Stoughton is one of the few that costs less than the standard figure. It covers much the same ground as *Professional and Business Uses* but costs only £4.95. There is a lot in this book, so the information-per-penny ratio is fairly high. At the end is an appendix of fun programs that did not excite my jaded palate; in fact most of the programs are a bit lacklustre. However, it is a good meat-and-potatoes primer, enough to feed most people's basic needs.

Newnes brings us *Sinclair QL in Business*, a weirdo book in a grey cover. Let me give you a taste, taken from chapter 14: "There's a nasty epidemic of an ear infection in Irkutsk. Up to 180 people a week are reporting to the clinic with an evil-smelling discharge and the side of the face too painful to touch." It then goes on to describe how one might diagnose

BOOK REVIEWS



the epidemic using the QL. Actually, this book is the nearest thing yet to a joyful romp through the happy world of business computing. How many business books have you read that bring a smile to your face? The quixotic author has decided to use Quill as a database, and Abacus as a word processor. I like this book; it has wit and charm, it is inventive and bright.

Unlike *Maximize your QL* from Papermac. I almost cried as I tried to plough my way though this epic tome. It is not a bad book, just a very dull one, although with some decent ideas.

The Working Sinclair QL from Sunshine Books follows hard on the heels of a whole series of "working" books. It sometimes seems as though David Lawrence has covered every computer from the Acorn Atom to the Cray 2. It is a sourcebook of useful Basic programming ideas and little more. Recommended reading for anyone learning to program.

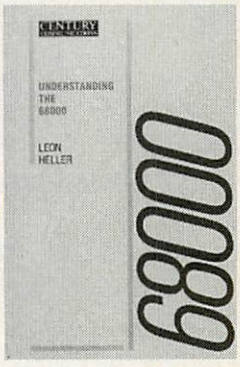
The Real Thing? from Sigma Press is a introduction to engineering-simulation programming. It is one of the few innovative books in this survey, with programs to mimic the functioning of a gas turbine, an eye and a volcano, among others. From Interface — the original

ZX-81 newsletter publishers — comes Tim Hartnell's *QL Handbook*. Tim is an old hand at this game; he writes computer books in his sleep. His books are always packed full of programs, and this is no exception.

The title of *Quick QL Machine Language* has to be a contradiction — after all, if machine-language programming can be quick, why would anyone want to resort to Basic? Published by Melbourne House, the book has one really attractive feature: a 68000 assembler written in SuperBasic. There is also a disassembler listing for those

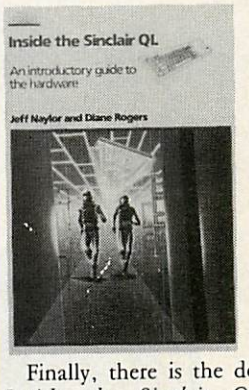
who want to probe into the depths of the QL. It would take days to enter these long programs; hardly quick is it? For a machine-code book, there are an awful lot of SuperBasic programs, but also a wealth of material to get you started.

Bernard Babani's *An Introduction to QL Machine Code* is another pocket-size book. It assumes no knowledge about machine-code programming, and aims to take the reader to the point where he or she is able to design and run simple programs. Speaking as someone who has spent a lifetime trying to avoid machine code, I found this modest little volume almost tempted me



to stray from the straight and narrow.

I was brought back from the brink by *Understanding the 68000* from Century Communications. It is not specifically about Sinclair's computer, but does cover a lot of the same ground as the QL machine-code books. It is really far too technical for non-programmers, but then most machine-code books fall into the same trap. Unlike the bulk of books about machine code, it is actually written in English, so if you are planning to dip your toes in the turbid waters of 68000 programming, this will guide you.



Finally, there is the delightful *Inside the Sinclair QL* from Sunshine Books. This is a fine example of something that has become rare these days, a hardware book. It explains how the micro actually works. None of the information in the book is essential, but it makes an informative and interesting read. If your interest in the QL goes beyond simply using applications software, this is a book for you. PC

COVERING THE QL

An Introduction to QL Machine Code by R A Penfold and J W Penfold. Published by Bernard Babani, £2.50. ISBN 0 85934 131 3

Into the QL Archive by J W Penfold. Published by Bernard Babani, £2.50. ISBN 0 85934 135 6

Database Management on the Sinclair QL by Mike O'Reilly. Published by Hutchinson, £7.95. ISBN 0 09 160551 2

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QL Handbook by Tim Hartnell. Published by Interface, £7.95. ISBN 0 947695 19 2

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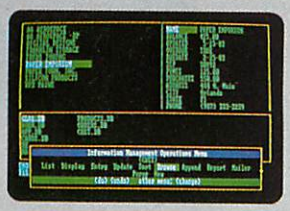

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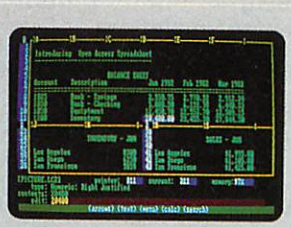

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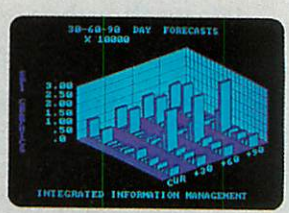

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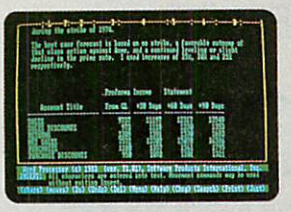

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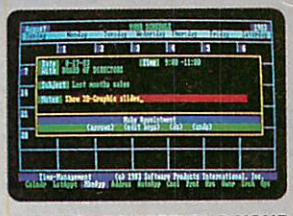

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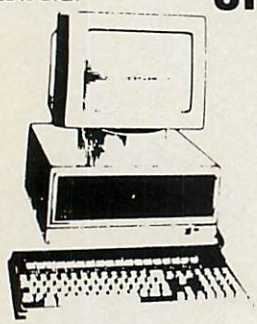

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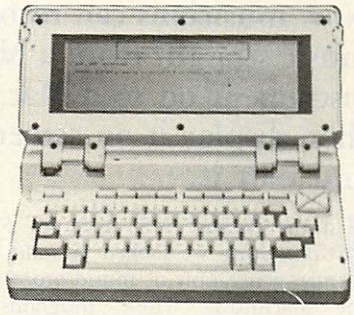

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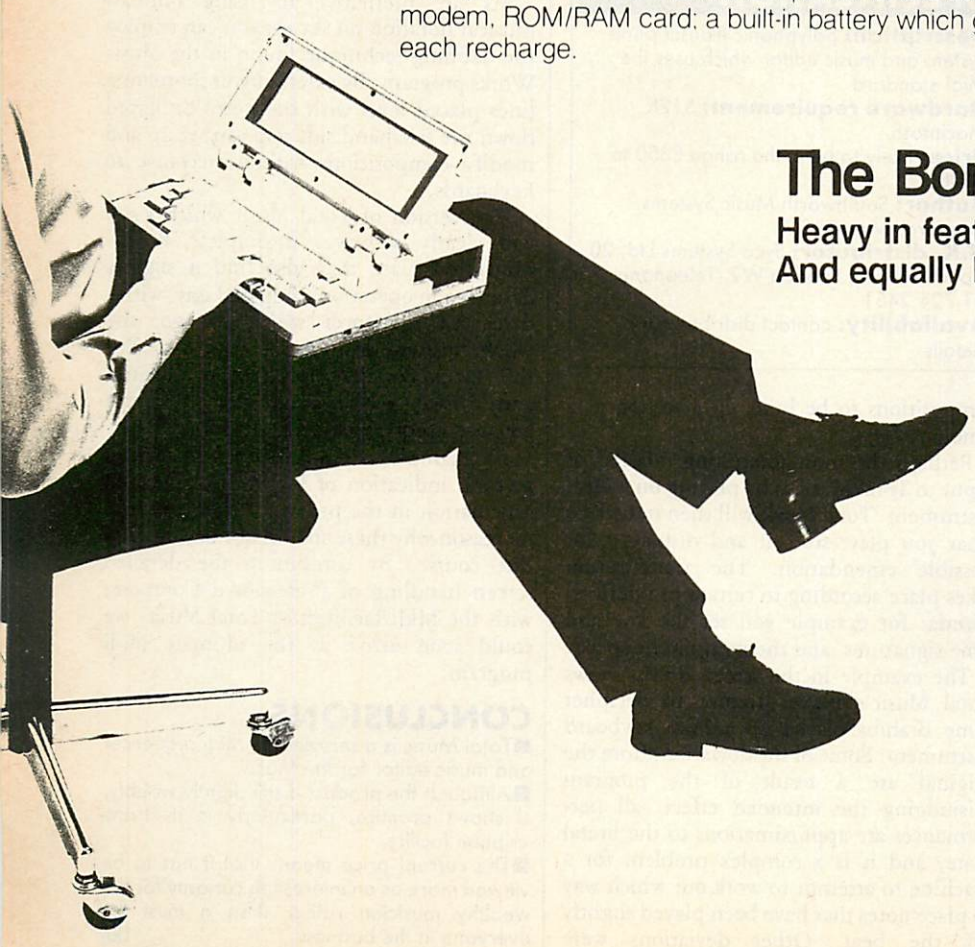

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TOTAL MUSIC
MIDI SEQUENCER AND EDITOR

By Glyn Moody

Now musicians can record music straight from a Midi instrument on to a Mac, then display it on-screen and edit it.

In the August 1985 issue of *Practical Computing* we looked at some of the new generation of music processors on the Macintosh. These programs were essentially output-orientated, designed to produce neat and correctly laid-out scores. They were thus of little direct interest to the performing musician, who is more concerned with input. In particular they lacked any ability to use the de facto digital standard in the electronic music industry, Midi.

The package Total Music, from Southworth Systems, is a first step towards using the Mac as a Midi machine. It is also significant for the progress it has achieved with the tricky problem of polyphonic transcription — that is, working out and displaying the pitches and durations of several voices being played on a Midi instrument at once.

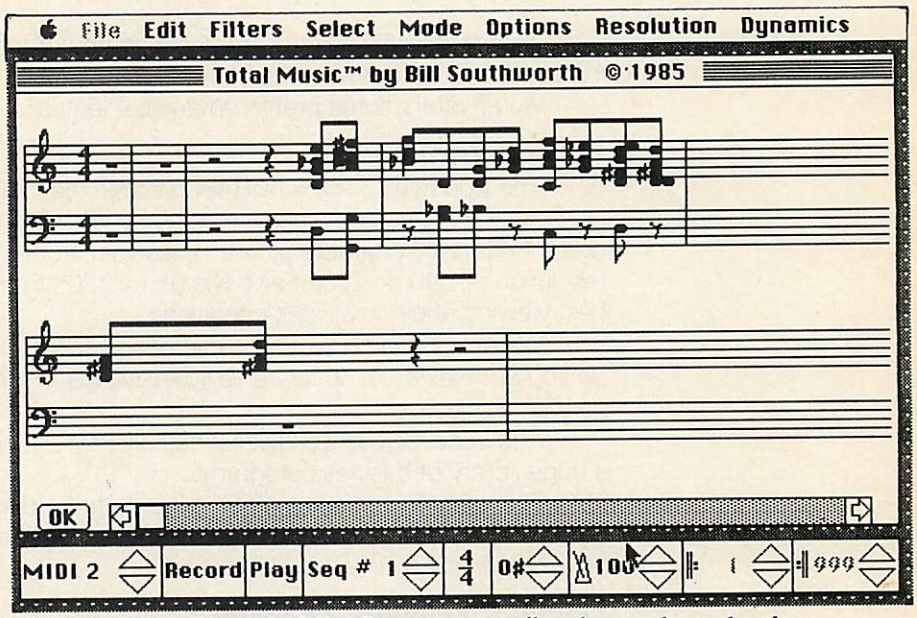
16 INSTRUMENTS

Data is passed across the Midi interface as a serial stream. The Midi standard allows for up to 16 instruments or independent elements to be linked and controlled simultaneously. This is done by means of control codes embedded in the data to identify what belongs to which channel.

The data sent to each channel includes a signal to start and stop a note, its velocity — which is synthesiser-speak for how loud it is — and information on the exact nature of the sound. This is normally sent in the form of a reference to a predetermined sound, known as a patch. Libraries of patches are stored on each instrument and can be called up with simple commands.

The advent of a digital standard for electronic music has led to a tremendous growth in the use of sequencers. These are simply solid-state equivalents of tape recorders: in place of magnetic tape storing sounds as varying magnetic fields, the sequencer stores a series of Midi digits in RAM.

Once notes are stored their characteristics can be manipulated as separate data entities. This is one of the main functions of Total Music, which lets you enter musical voices, and then adjust them on-screen. Each Midi channel can be handled in turn, allowing compositions to be built up a section at a time.



Total Music uses the standard Mac format to transcribe what you have played.

SPECIFICATION

Description: polyphonic transcription system and music editor which uses the Midi standard
Hardware requirement: 512K Macintosh
Price: likely to be in the range £350 to £500
Author: Southworth Music Systems, Harvard, Ma., U.S.A.
U.K. distributor: Syco Systems Ltd, 20 Conduit Place, London W2. Telephone: 01-724 2451
Availability: contact distributor for details

Perhaps the most interesting method of input to Total Music is by playing on a Midi instrument. Total Music will then transcribe what you play, store it and display it for possible emendation. The transcription takes place according to certain pre-defined criteria: for example you set the key and time signatures, and the metronome speed.

The example in the screen dump shows Total Music's brave attempt to decipher some Brahms played on a Midi keyboard instrument. Some of the deviations from the original are a result of the program misjudging the intended effect: all performances are approximations to the literal score, and it is a complex problem for a machine to attempt to work out which way to place notes that have been played slightly off the beat. Other deviations were introduced at the time it was played.

As an alternative to using ordinary musical notation on staves, you can employ the daubing technique found in the Music Works program. By extending or shortening lines placed level with the notes displayed down the left-hand side you can set up and modify compositions without recourse to keyboards.

The version of Total Music which I saw was clearly somewat incomplete Professional musicians may also find it slightly daunting in operation compared, say, with a dedicated sequencer which has got the whole business down to a few buttons. But the Mac potentially offers a range of control and display way beyond even the most advanced sequencers available today.

For example, although the screen displays give no indication of loudness or detailed articulation in the present version, there is no reason why these should not be added in due course. By combining the detailed screen handling of Professional Composer with the Midi facilities of Total Music, we could soon arrive at the ultimate Midi program.

CONCLUSIONS

- Total Music is a serviceable Midi sequencer and music editor for the Mac.
- Although the product is still slightly wobbly, it shows promise, particularly in its transcription facility.
- The current price means that it has to be viewed more as an interesting curiosity for the wealthy musician rather than a must for everyone in the business. PC

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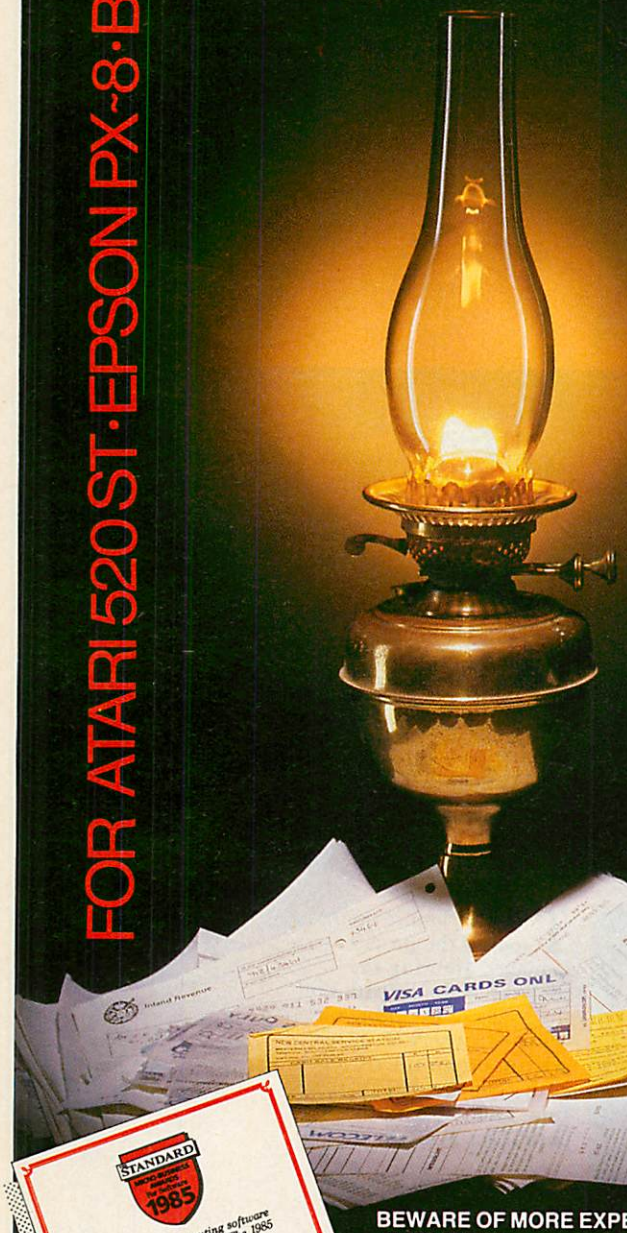

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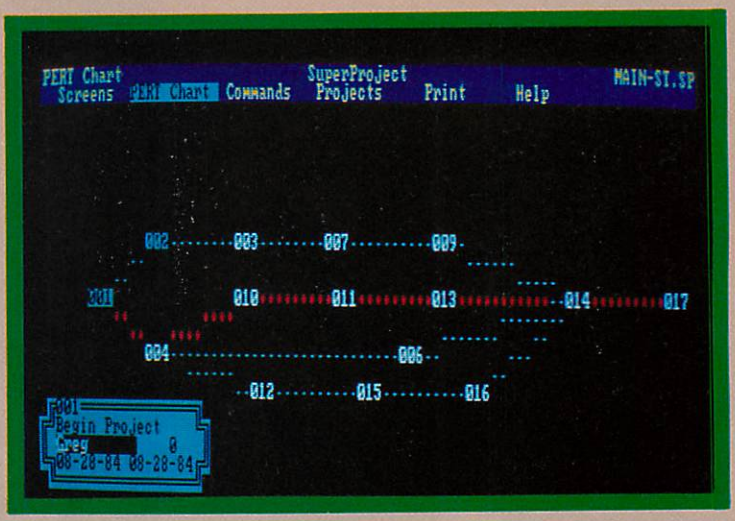
● Circle No. 188

Evaluation copies are usable but a restriction on the number of entries exists: on payment of the balance (£97.75 for Cash Trader only, £132.25 for Cash Trader with Analyser) you will be given a password to remove the restriction and enable full use to be made.

Project managers start with a calendar to define the basic working period — day, week, month or whatever — and to plot the jobs to be scheduled. This is the calendar display from Superproject. Some systems can run several calandars for different groups of people or other resources on the project.

There are two ways in which project managers build up a network. This is a precedence network, as displayed by Superproject, in which an activity is defined by its duration and the indentification of the activity which precedes it. The second method is known as Activity on Arrow, in which an activity is defined as a duration between two events or nodes.



The bar chart is the basic tool of the project manager, showing the progress of the activities in the project. The program calculates which of these activities form the critical path. This is a bar chart from Hornet, with the critical path shown in red.

HORNET 4000 : Ops Mode Screen Bar Chart D:Greens :(C)
1 Machine 1
101 Machine 2
401 Machine 3
2 Pre production run
102 Debug cont sys & trn
402 Complete inst mc3
403 Chk spares requd
300 Quality test
404 Order spares
350 Pre prod run mc2
5 Debug cont sys/run
405 Machine align check
406 Align check mag feed
430 Align chck fixtures
30 Quality test
410 Align check weld hd
40 Pre-production run
415 Align chck tube supt
420 Align chck out feed
425 Align chck sensors
435 Comm chck cont sys
COMMAND
Enter
:4 :11 :18 :25 :1 :8 :15 :22 :29 :6
March 85
April 85
Ma

percent of packages produced are for export, particular to the U.S.

The hardware requirements of the various programs are fairly standard. With the exception of the multi-user software and the Macintosh programs they run on straightforward IBM PCs and their clones. Twin floppy discs are a minimum for mass storage but a Winchester is recommended, especially for those programs where the network is stored on disc. There is a trade-off between disc and RAM requirements here. Superproject, Timeline and Pertmaster hold and update the network in store, so you do not have continual disc accesses to contend with. But these systems need up to 640K of RAM to house a 1,000-activity network, where the others get by with 256K or 320K.

Another area of trade-off is between complexity and speed. Analysing the network and scheduling resources are both heavy computational jobs, so the Heavyweights tend to run more slowly than the Tabloids because they are more ambitious.

The only extra demand for hardware imposed by the Heavyweights can be for printers and plotters. Bar charts and network diagrams look very good printed in glorious technicolour, with critical paths in red, on colour printers or plotters. The Tabloids do not attempt to support this sort of facility.

Richard Sarson will complete his examination of project planners in next month's issue with a detailed look at the capabilities of the individual packages. PC

PROJECT PLANNERS
JUST ONE THING AFTER ANOTHER

By Richard Sarson

Scheduling and costing complex jobs is made more efficient and convenient by this new breed of software.

Whether it is cooking lunch, building a block of flats or sending a man to the moon, you want to know how long the job is going to take and how much it will cost. Not much harm will be done if the egg and chips overruns its schedule by a couple of minutes, but a miscalculation somewhere in the middle of a long project could have more serious consequences.

Guessing how long a job will take is probably good enough for a short, familiar task, but for anything more complicated the better way is to break down the whole process into steps or individual activities. You can then define their sequence and how they interrelate, and draw up a network of the project with milestones and deadlines along its course.

Once the network has been established, you can work out what resources are needed for each activity. These include people, plant, raw materials and, most important, when they will be needed and how much they will cost. Lay these activities and resources end to end and you have a better idea of when you will get the man to the moon, how many technicians, computers, rockets and tonnes of fuel you will need, and how much it will all cost.

MONITORING

But the planning stage is only the start. Once the job is under way you have to check that the plan does not slip. If something goes wrong early on, you need to be able to adjust the later stages. Also you have to be able to keep tabs on the money to see that costs do not overrun. These activities are part of the monitoring phase, which is really just planning on the fly.

Finally, when the job is done, you need to be able to feed back your experience so that you can learn from your mistakes. Thus you can improve your methods of estimating time and resources, and so your planning for future projects.

In principle, all this can be done with pen and paper, but it becomes arduous if the project is a large one — say 100 activities or more. Deciding the shape of the network and the resources each activity needs must always be done by hand. The computer comes into its own when you start to aggregate the individual activites into a complex whole, and it allows you to try out a number of alternative plans with relatively little effort.

Most important, the computer can identify those activities which will hold up the completion date if they slip, as opposed to those on which there is some leeway. From these critical stages you can work out the so-called critical path through the project. The computer will do this in minutes rather than days and so takes the donkey-work out of planning.

CRITICAL-PATH ANALYSIS

Critical-path analysis is a technique which has been around for 25 years or more. Among its earliest users were large-scale construction companies and defence establishments, which implemented it on the cumbersome mainframes of the day. It is only in the last two or three years that the small-scale, localised computing power has become available to make automated critical-path analysis a practical proposition for less complex tasks. Much of the newer software is intended for smaller-scale applications, right down to planning an office relocation or doing a market survey. Even software managers use it to control the development of a new package.

Project-management software is therefore beginning to climb the growth curve already followed by spreadsheets and word processors. A poll of American computer users showed that the installed base of project-management systems increased by 52 percent in 1984. Another survey, by *Venture* magazine, showed that 25 percent of those who use computers for business include project management as one of their applications.

Microcomputer project-planning software falls roughly into two camps, rather like newspapers: the cheap and cheerful Tabloids and the in-depth Heavyweights. The Tabloids include such packages as Pertmaster, Superproject and Macproject. They do not define the project as closely or give as many fancy reports as the Heavyweights, and they are relatively cheap — in the range £100 to £700. Pertmaster is British, but the rest are American and tend to have chatty tutorials couched in American terminology. You have to get used to using "task" instead of "activity", "schedule" instead of network", and so on.

Most of the Tabloids take pains to offer visual and user-friendly input screens and displays. You can see the critical path and the finish dates change before your very eyes as you play What-If? games by inputting new start dates on the screen. These programs were designed to tap the new market that the spread of micros has stimulated. They are aimed at the executive who has to supervise a moderately complex job from time to time, not at the professional project manager.

On the other hand the Heavyweights are heirs to the heritage of the large-scale critical-path analysis systems of old. They include programs such as Artemis, Cresta, Hornet, Kernel, Microplanner and Plantrac. They can handle big projects, and since they are based on powerful data-management systems they can link into related systems like materials control or job costing.

Unlike their Tabloid cousins, the Heavyweights require some knowledge of project management and computers from their operators; they are not for the casual user. Prices range from £1,250 for Microplanner to £15,000 for Cresta. The programs I looked at are British, but many of them are worldwide success stories and up to 50

GLOSSARY

Activity The smallest work unit within a project; U.S. *task.*
Bar chart A horizontal bar graph, rather like the traditional year planner, to show the progress of a project; U.S. *timeline, schedule.*
Critical path The string of activities that must be completed on time for the project to meet its deadlines. Critical activities have no float.
Duration The elapsed time of an activity.
Float The length of time that an activity can be delayed before it becomes critical; U.S. *slack time.*
Gantt chart A specialised form of horizontal bar chart designed to highlight deviations from planned performance on both a daily and a cumulative basis.
Leads and lags A symbolic way of representing activities which start or finish before the preceding activity has finished.
Project network Diagram showing all the activities in a project linked by their dependences to one another; also known as a Pert chart.
Resource scheduling Calculating how resources are used up during the project. Some systems signal overloads, others automatically level the peaks and troughs, while others stretch the project to avoid overloads.

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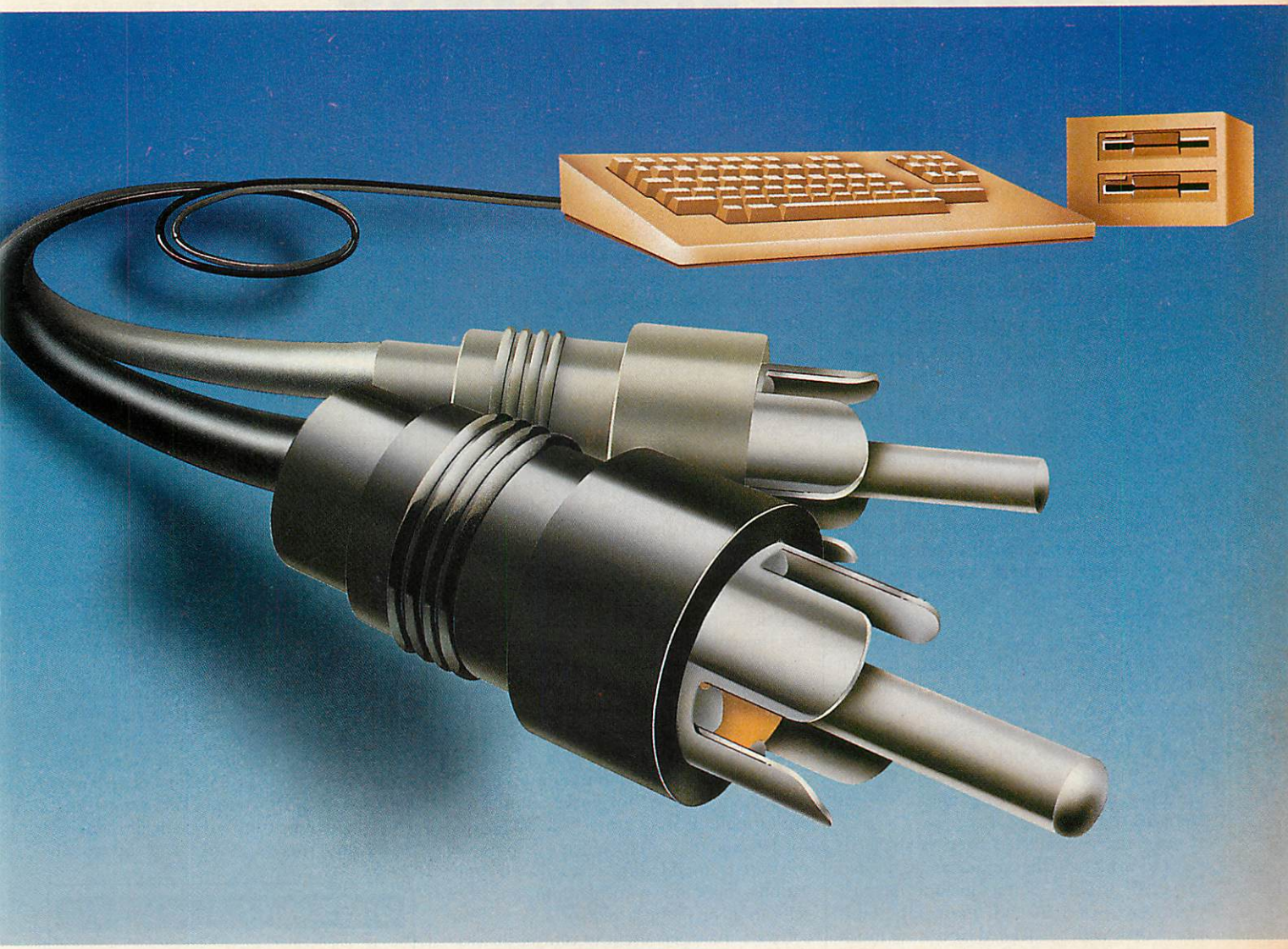

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READY SET GO

Ready Set Go from Manhattan Graphics is a less sophisticated package than Aldus Pagemaker and costs a fraction of the price.

Learning Ready Set Go is fairly simple, the manual doubles as a tutorial, and within 20 minutes or so you should be capable of creating fairly sophisticated page layouts.

Ready Set Go is based around the concept of blocks. Four types of block exist: text, frame, solid and picture. Text blocks can be used to type in new text through the keyboard, or to take in Macwrite or Microsoft Word files transferred via the clipboard. Once in the text block, the text can be altered using the Modify option from the Edit menu.

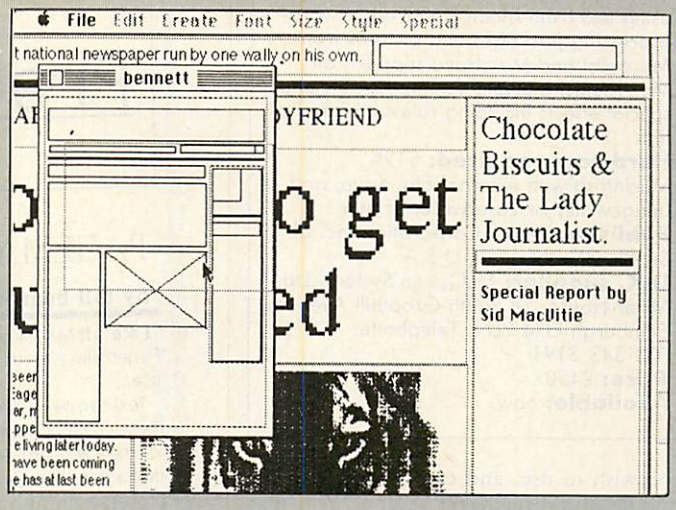
Frame blocks allow you to create borders in four different shades, as well as draw rules and boxes. Solid blocks are used to draw boxes which can be filled with any of four patterns. They are of little use in their own right, but you might want to use a solid block to mark an area on your printed Ready Set Go page which you could paste a photograph on to before photocopying. Picture blocks allow you to place pictures on to your page. Ready Set Go will accept pictures from both Macpaint and Macdraw but, like the text, they have to be imported to the program via the clipboard.

Blocks are initially placed on the screen as one-inch squares. You can move them around using the mouse, enlarging and modifying their shape. Alternatively, you can use the Modify command to specify the exact placing of the blocks to a resolution of 10^{-4} inch, which is far finer than the resolution of the laser printer.

You can use Modify to alter the size of pictures, which can be cut and pasted from Macpaint. When a picture is transferred to a picture block from the clipboard, it is automatically resized to fit the block. Unfortunately, unless the block is exactly the same size as the Macpaint picture, this causes distortion. I found that it was usually easier to set aside a solid block for the picture, and print the Macpaint picture separately, cutting and pasting it into the document physically using scissors and glue.

One useful feature is the ability to save layouts without the block contents, so you could save a particular layout to use as a template for further pages. This allows you to keep to a certain style throughout your publication.

However, Ready Set Go has limitations which make it cumbersome to use. For example, it does not show much more than half a page at a time. You have to peer at the finished page through a window, and you can only move that window


File Edit Create Font Size Style Special
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around using a mechanism similar to Show Page in Macpaint. Copy can be inserted from Macwrite using the clipboard or the scrapbook, but it cannot be carried over from one text block to another. In addition, it cannot handle multiple pages, preferring to treat a document as a series of single pages.

But despite its limitations, Ready Set Go is easy to use and learn. If you were trying to prepare pages of a magazine from word-processor files it would be unsuitable, but for less demanding applications it could be ideal, albeit slower to use than Pagemaker.

SPECIFICATION

Description: page make-up package; works with Macwrite or other word-processing packages, Macpaint and Macdraw
Hardware required: 512K Macintosh and either Imagewriter or Laserwriter printer
Publisher: Manhattan Graphics Corporation of New York, U.S.A.
U.K. supplier: Heyden Datasystems, Heyden and Son Ltd, Spectrum House, Hillview Gardens, London NW4 2JQ. Telephone: 01-203 5171
Price: £125
Available: now

(continued from previous page)

The tabs at either end of text blocks can be moved up and down to accommodate other features that you might want to place on your page. The top table will move the whole text file up, down or across the page.

Pictures are entered in a similar manner using a special graphics cursor. A graphic consists of any Macwrite or Macdraw image and may cover a complete page. Once entered, a graphic can be cropped or resized, but it cannot have its design altered. Boxes, shapes and lines can be drawn in a variety of sizes, and filled with a variety of shades. It is even possible to have white text on a black background.

The page-design process is not difficult but of course no amount of high technology will turn a poor design into a good one. A number of zoom features aid the process. The page can be made small enough to be shown complete on the screen, and it is even possible to display a complete double-page spread. There are a number of intermediate picture sizes, and a 200 percent magnification facility can help when making fine adjustments.

One other excellent feature is the holding area. If you have something you want to use, but are not yet at the right page for it, or have run out of space, you can store it in a holding area on the screen next to the page.

A 512K Mac is essential for Pagemaker, and a second disc drive is needed too. I found it best to keep a system disc, richly laden with founts, on one drive, and Pagemaker on another. There is not enough room to put everything on one disc, and importing copy from other applications can be very tedious with a single-drive system.

Publications designed using Pagemaker are stored as Postscript files, so they are compatible with the Apple Laserwriter or with some typesetting systems. It would be possible to produce a newsletter or magazine using the package, send the file to a printer and get back camera-ready copy or even the finished product.

The pre-release version of Pagemaker had a number of bugs, which I expect to see ironed out in the production version. The most annoying one is that if a fount used on a Pagemaker page is not in the current system file, the whole program crashes. Also, I could not cut and paste copy once I had placed it on a page.

CONCLUSIONS

■Pagemaker is the first truly useful page-design program to appear for a personal computer. It sets the standard for future packages to follow, and for many users it will justify the purchase of a Macintosh and Laserwriter.

■On its own, Pagemaker is simply a layout tool. Although it will help you produce some very professional-looking results, it is not capable of the sophisticated typography and design you expect to see in news-stand magazines.

■When used with the Apple Laserwriter, Pagemaker is capable of producing documents of a quality second only to those produced by real typesetting machines.

■It is easy to use, and interfaces very well with other Macintosh software like Macwrite, Microsoft Word, Macpaint and Macdraw. PC

SPECIFICATION

Description: page make-up package which lets you create multi-column pages using text from Macwrite or other word-processing packages and pictures from Macpaint and Macdraw; supports all Mac founts, multiple-column layouts and special effects including rules, boxes and tints
Hardware required: 512K Macintosh with external disc drive, and Imagewriter or Laserwriter printer
Publisher: Aldus Corporation Inc. of Seattle, Washington, U.S.A.
U.K. supplier: McQueen Systems Ltd, Miller House, 18 South Groathill Avenue, Edinburgh EH4 2LN. Telephone: 031-343 3191
Price: £450
Available: now

Practical Computing

PAGEMAKER

By Bill Bennett

Like all Macintosh software Pagemake is very simple to use.

Text can be pasted into these columns from MacWrite via the Clipboard. Formatting instructions from the word processor are also carried across. But you can also type text in from the keyboard.

SHADED BOXES

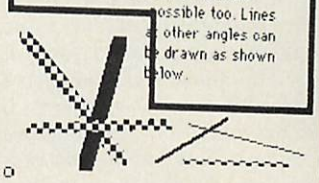
Putting small sections of text into shaded boxes is easy enough. However, they tend to look much better when filled with a bold type like this 12 point Chicago. The type of shade is selected from the Shades menu. You can put a line around it by selecting a box from the tool box, and the type of line from the Lines menu.

You can select the number of columns to run the text across the page, and then specify the gap between. The program will space them evenly, but you can change the layout to produce, say, two and a half columns. In this case, I have adjusted the with of this and the next column to accomodate the non-standard size of my bear picture.

Once you have chosen the number of columns, you wish to use. Simply use the cursor to pull the edges of the column whose size you wish to change.

PICTURES CAN be cut and pasted from Macpaint or the Draw program via the clipboard. This uses the Place function from the file menu.

Lines of differing widths can be drawn on the page in a number of ways. The lines shown around this text are rectilinear, in parallel to the grid lines. Patterned lines are possible too. Lines at other angles can be drawn as shown below.



WHITE ON BLACK

Blocks of reversed out text, sometimes referred to as wobs (white on blacks) can be created. It is better to type on the black background, as it can sometimes be difficult to see what is going on.

PAGEMAKER

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	☐	■
Documentation	☐	☐	☐	☐
Value for money	☐	■	☐	☐

☐ Excellent package expanding the use of the personal computer into a new area, but too expensive for non-specialist users.

you wish to use, and can change it in the middle of a Pagemaker session. You may want to do this if, say, you are measuring text in picas and photographs in inches.

The column-guide commands are not permanent. So if you want to run a headline across the width of the page, you need to specify a single column at first, changing it to a three-column specification to enter the bulk of the text, and to maybe a four-column measure to fit some extra copy in at the bottom. It may seem inelegant, but it is a very flexible system.

DESIGN GRID

A good practice is to design a set page format for the whole document, and stick to it all the way through. Magazine layout artists use a similar manual system, where they have grid sheets printed with the possible page layout formats, and all their designs usually keep within these set boundaries. This gives publications and documents some coherence and makes them look that much more professional.

Once the page mechanics are sorted out, you can get on with laying out a page. Text can be entered either by typing in at the keyboard, or by placing it on to the layout via the Place command.

Place allows you to open, say, a Macwrite disc, examine the list of files that it contains, and open one of them. Once the disc is opened, a special text cursor appears on the layout screen. This is placed in the position that the text is going to run from, and the mouse is clicked. The text then flows into the column, stopping when it ends or, if it is a long file, at the bottom of the column.

If the text does spill over the bottom of the column, a line appears at either end of the text, with a tab at each end. The bottom tab will have a + sign printed on it, indicating that there is more to come. All you have to do is click the tab, and the text cursor reappears. Move this to the point where you want the text to continue from, and enter it again.

You can keep on entering text in this manner until the end of the page. At that point you create a new page, and continue entering the text. A Pagemaker publication can only be 16 pages long; if you want more than 16 pages you must produce two or more files. Once the text file is entered, an insertion or deletion at any point in the file will cause the entire text to reflow to adjust.

Any formatting, fount or style commands that come from the word processor are retained, though you can change them if you wish. For example, if the text is nine point Helvetica italics range left, but to fit in your layout you want it to be 12 point Chicago bold centred you could alter it accordingly. Pagemaker can handle any number of founts that are available on the startup disc in sizes ranging from six point to 72 point. You also have the ability to change the leading, so that the text can appear with more or less space between each line.

You can put different column widths and type styles of the same page, but the result can be messy.

Pagemaker allows text to be inserted in more than one column width. So in a newspaper-style publication, you could have a lead story running over half the front page, and it could finish on page two across only one-third of the page. The column-guide option the menu creates equal-sized columns across the width of the page, but you can alter them using the cursor once they are on the layout, so a two-and-a-half-column layout is possible, for example.

(continued on next page)

PAGEMAKER
PERSONAL PUBLISHING

By Bill Bennett

With the aid of a 512K Mac and an Imagewriter or Laserwriter you can now present word-processed text and graphics in a form fit for publication.

One of the best features of a word processor like Macwrite is that the user has a great deal of control over the presentation of a document. First, the text has to be typed into the word processor. Then the user can fiddle around with the copy, until he or she is happy with how it looks on the screen before finally printing it. For most day-to-day purposes, Macwrite is more than adequate.

Although it is suitable for most documents, Macwrite has a number of limitations. For example, it cannot handle multiple columns of text, nor can pictures appear alongside text on a Macwrite page. If you wanted to produce a newsletter with a headline running right across the page, and two columns of text running down the page, with a diagram in one of them, you would need to prepare the bits of text using Macwrite, prepare the diagram using Macpaint or Macdraw, and then paste up the various bits on another sheet of paper. If you were being really adventurous, you could try producing the whole page using Macdraw.

The alternative is to use Pagemaker, from Aldus. It is a new type of software product that effectively turns the Macintosh into a limited version of the layout desks that can be found in any magazine or newspaper office. The pens, sheets of paper, rulers, scalpels and pots of glue that have hitherto been needed to assemble a printed page can all be quietly put aside.

As it stands, Pagemaker will not allow even the most talented art editor to design anything as professional looking as *Practical Computing*, but it will enable a new level of design flexibility to become available to more modest forms of publishing. For example, company newsletters and sales catalogues can be easily and stylishly produced, as can business proposals and reports.

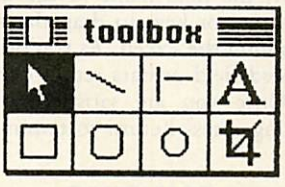
At the moment, a number of manufacturers of typesetting equipment are mating their hardware to the Macintosh in order to produce some exciting new products at the bottom end of the typesetting market. We could be heading for a new publishing era, with even the poorest pressure group being able to produce typeset publications.

GOOD GRAPHICS

Page make-up programs would be difficult to implement elegantly on micros other than the Macintosh. They need good high-resolution graphics, and cutting, pasting and cropping blocks of text or pictures on-screen can be a difficult business without a mouse. The made-up pages are at their best when printed by the Apple Laserwriter, though reasonable results can also be produced with the Apple Imagewriter.

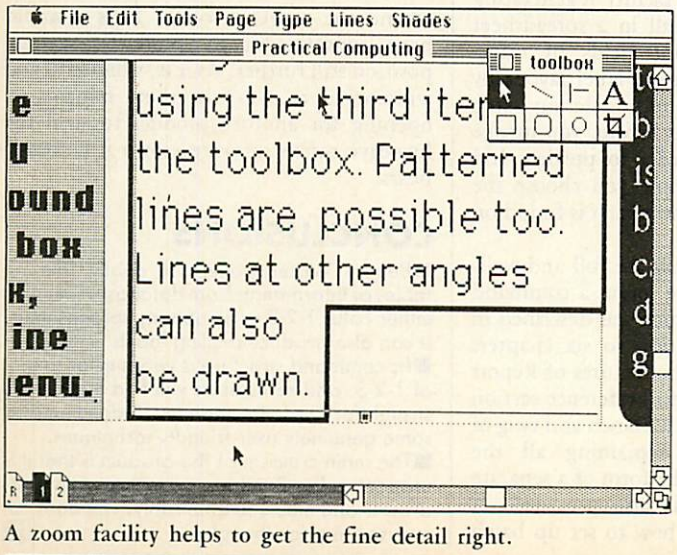
Pagemaker's main advantage over other layout packages is its ability to directly open documents created with Macwrite, Microsoft Word, Macpaint and Macdraw, using the Place command. I used the review version of the software, which was a pre-release version with no documentation, together with Macwrite, Macpaint and Macdraw.

The Macintosh screen, which is normally a representation of a desk top; becomes a layout table. In the corner is a toolbox — see below — with eight tools. It takes no more than 30 minutes to learn to use the program; even less if you are familiar with a Mac.



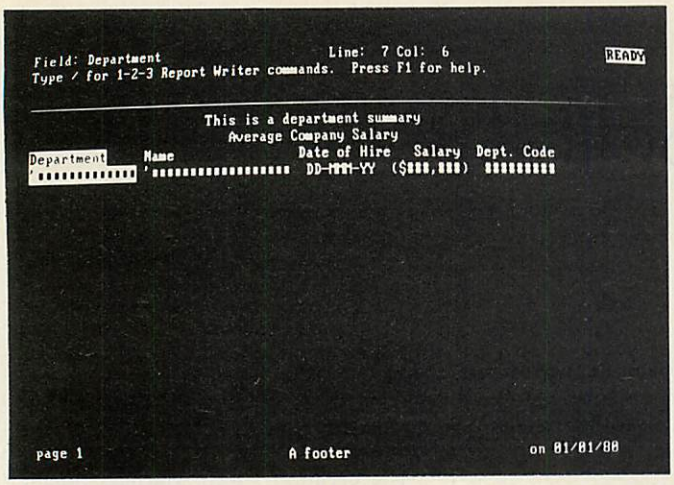
A useful modus operandi is to first set up a page format using the Page Setup command available from the file menu. This works in a similar way to Page Setup in Macwrite or any other application, but in Pagemaker it is essential as it defines the page which is to be laid out. In addition to the usual options, you can specify the size of the borders around the edge of your text on the page.

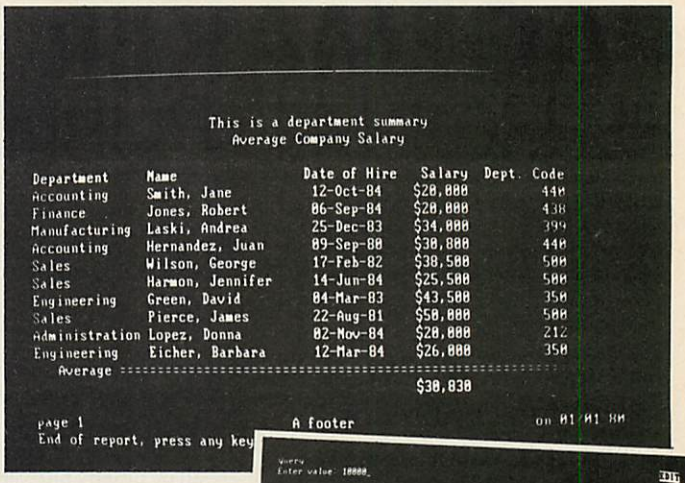
The next step is to specify the number of columns that are going to run across the width of the page. Four page sizes are available: A4, B5, U.S. letter and U.S. legal. There can be any number of columns, and you have to decide what will look best and be easiest to read given the type size of the majority of the text and the width of the page. You can specify the gap between columns in inches, centimetres or picas. You can specify which system of measurement

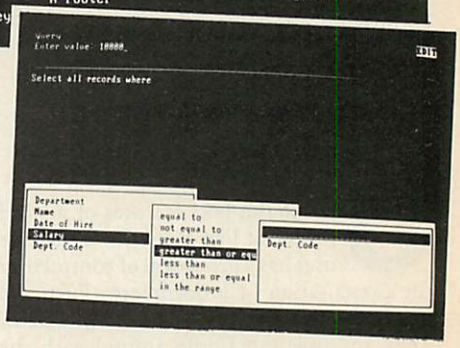


A zoom facility helps to get the fine detail right.

Images from Macwrite and Macdraw can be mixed with text.




This is a department summary
Average Company Salary
Department Name Date of Hire Salary Dept. Code
Accounting Smith, Jane 12-Oct-84 $28,000 440
Finance Jones, Robert 06-Sep-84 $28,000 438
Manufacturing Laski, Andrea 25-Dec-83 $34,000 399
Accounting Hernandez, Juan 09-Sep-80 $30,000 440
Sales Wilson, George 17-Feb-82 $30,500 500
Sales Harmon, Jennifer 14-Jun-84 $25,500 500
Engineering Green, David 04-Mar-83 $43,500 350
Sales Pierce, James 22-Aug-81 $50,000 500
Administration Lopez, Donna 02-Nov-84 $20,000 212
Engineering Eicher, Barbara 12-Mar-84 $26,000 350
Average $30,830
page 1
A footer
End of report, press any key



Above left: The basic format screen.
Above right: Reports can include field headings and averages, as well as neatly formatted text.
Right: Report Writer automatically displays a sequence of query options, depending on the previous choice.

As with commands, this is carried out either by typing in the first letter of the field name, or by using the cursor keys. You then choose Move from the main menu. You then have the option of moving both the field and its identifier, the field name or the data, by using the cursor keys to drag the selected object around the screen. As you do so, the highlighted field or data scrolls over other fields. Once you are satisfied with the positioning, press Return to terminate the move.

PRINTING

Printing is handled from the subsidiary Print menu. Initially this displays an image of the report, indicating height, width and margins. Before printing directly, you can preview the final appearance of the report on-screen with the data fed in from the spreadsheet.

Once a report format has been set up for a spreadsheet, it can be saved in a library. The library is a collection of report formats named after the spreadsheet for which the formats were developed. The report itself can be given any name within the library. So if the spreadsheet is called

NAMES.WKS

a library called

NAMES.RPT

will be set up to hold the various formats created for reports based on the Names spreadsheet which will have been named at the time of saving. When loading a format, you select the library first and then the report.

The facilities described so far are fairly passive in that they merely pipe the data as stored in the spreadsheet to certain report positions. Report Writer also has a number of more active functions which act on the data in an intelligent way. For example, you can sort on any of the fields. You can set up to four keys, so that after sorting on one of them, say Department, you can then sort on a subsidiary field to produce an alphabetical list within departments.

Perhaps the most powerful feature of Report Writer is its ability to create a Query. This corresponds closely to 1-2-3's Data Query commands, and allows you to pull out those records which meet certain criteria: for example, all those employees living in London with salaries of over £7,000 who have been with the company more than four years. But instead of the opaque series of commands necessary in the earlier package, Report Writer offers a natural windowing approach.

Upon invoking the Query command, you are presented with a screen which offers to

select.all.records.where

The field names appear in a small window at the foot of the page. Selecting one causes a second window to appear, slightly overlapping the first. The options are the standard ones of greater than, less than, not equal to and so on. Selecting one of these brings up another window in which you can specify what the criterion for selection is. To carry out the queries and any sorts, you must proceed to the printout, though this can be to screen rather than paper if you just wish to inspect the results. This menu-driven approach proves simple to use. Perhaps one day similar changes will be implemented on 1-2-3 or its successors.

MAILING LABELS

As well as producing neatly formatted reports from spreadsheet databases, Report Writer offers the handy facility of generating mailing labels. You pull in a spreadsheet containing the relevant fields of information, and then create a label layout by moving the fields around, deleting some perhaps, and so on. As before, you invoke the Print option in order to preview and then print, but this time you choose the Mailing-labels command which is found on the Options menu.

Although the manuals are full and well-written I was unable to locate a command called Word Order, which was described in the manuals. In addition to six chapters leading you through the features of Report Writer, there is a very full reference section which goes through each branch and twig of the command tree, explaining all the options. A version in the form of a separate quick-reference card is also provided. A short appendix shows how to set up batch reports for the automatic creation of a series of reports. This would be handy, say, for the production of monthly statements. A further appendix on error messages and a good index complete the manual.

If many of Report Writer's facilities sound obvious and perhaps trivial, this is a reflection on the extent to which the program is addressing common needs. Hitherto, you have had to adopt all kinds of ad hoc fudges, often involving unsatisfactory compromises in appearance or detail. Report Writer changes all that, and allows you to do on 1-2-3 and Symphony all those obvious things you always wanted to.

The only questions remaining are why Lotus took so long to produce such a useful program, and why it costs so much. This program is going to sell anyway, but had the pricing been more moderate, it would probably have sold to almost the entire Lotus universe. It would have been far better if Lotus had made this the first of a whole series of cheap and useful modules which extend the range of 1-2-3. Thus it would have consolidated its product's leading position still further. As it is, wonderful and widespread as 1-2-3 is, there remains an opening for another product to steal the lucrative micro software crown it currently bears.

CONCLUSIONS

■ Report Writer generates neatly laid-out tables of information from databases set up on either Lotus 1-2-3 or Symphony spreadsheets. It can also produce mailing labels.

■ Its command structure is very similar to that of 1-2-3, and so its users will find it relatively straightforward. In addition, it does employ some genuinely user-friendly techniques.

■ The main criticism of the product is that it is unspectacular. But then so are the needs it addresses and meets so admirably. This does not excuse the price though. PC

LOTUS REPORT WRITER

ADD-ON FOR 1-2-3 AND SYMPHONY

By Glyn Moody

Now you can do what you always wanted to with this auxiliary program that produces neat reports from data held on Symphony and 1-2-3 spreadsheets.

When Lotus 1-2-3 was launched three years ago, much of the marketing brouhaha centred around the fact that it was one of the first of a new breed, the integrated package. Even its name was designed to emphasise its triple functionality of spreadsheet, database and graphics. However, in the light of later products Lotus 1-2-3 has emerged as more of an extended spreadsheet rather than a truly integrated program like Lotus's own Jazz.

Even in its more optimistic moments, Lotus has never claimed much in the way of text handling for 1-2-3, whatever its facilities in other areas. As a result, many of the million and more 1-2-3 users must have felt stymied by the limited reports that could be generated from it directly. With the launch of Report Writer, its first auxiliary software for 1-2-3, Lotus has at last remedied this. Report Writer costs £120, requires at least 256K RAM, and works with databases set up on both 1-2-3 and Symphony spreadsheets.

MANIPULATE AND PRINT

On both of these Lotus products, databases appear with the fields of a record placed in successive columns, and field names along the top. Each row of the spreadsheet represents a record. Report Writer allows you to print out all or some of these fields, alter the format of the report and perform a limited number of operations on the report data such as obtaining averages, totals and so on. There is also a facility that allows you to create mailing labels from a database of names and addresses.

As with 1-2-3, you have to install Report Writer before you can use it. After creating backup copies of the two discs or copying them to your Winchester, you run the Install program. This tells Report Writer what printers to expect. You can either set up only one printer, whose driver set will then be automatically loaded each time you use the program, or you can set up several, in which case at the relevant point in the printing porocess you are offered a choice. Those who found the intallation process for 1-2-3 daunting will be pleased to learn that Report Writer is largely menu-driven, with plenty of prompts and on-screen help.

The manual is also much clearer in this respect. Instead of 1-2-3's fat ring-binder there is a slim paperback. The print size is larger, and the general tone of the book much more approachable. Generally it is a model of clarity, though the standard Lotus team-colour of dirty maroon, used throughout for headings and suchlike, is unprepossessing.

One interesting development is that Lotus allows you to copy nominally copy-protected files on to your hard disc — but only once. Thereafter, you have to copy it back on to the master floppy before you can reinstall it. This saves you having to insert the master floppy in drive A every time you boot up. Perhaps one day we might even see a totally unprotected disc.

REPORT WRITER

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	■	☐	☐

☐ Not a technological breakthrough, but a very convenient product if your company picks up the tab.

Report Writer works by manipulating data held in 1-2-3 or Symphony spreadsheets in the form of tables of information. On loading and running the program, you are prompted for the name of the spreadsheet you wish to work on. It is inconvenient that it is not possible to view the table in its original form. You must either exit from Report Writer, and load 1-2-3 itself, or you need to set up some dummy report and view the data from that instead. So to use Report Writer you need to have a fairly clear idea of what your database looks like.

After the spreadsheet itself has been selected, you need to choose the form of the report in which it will be displayed. If you have not created a report format previously, you will need to create one. The Create command, like all others on Report Writer, is invoked by choosing from a short menu at the top of the screen, either by typing the first letter of the command or by moving to it with the cursor keys, and then pressing Return. As you move through the commands, a short explanation appears under the current command menu.

The form of the menu is identical to that on 1-2-3. You can call up the main menu by pressing /. Commands are then invoked by selecting them and pressing Return. This may lead to a sub-menu which is controlled in the same way. You can progress back up the menu tree by pressing Esc. Several of the commands handling such things as files and global parameters are identical with those on 1-2-3. This is probably one of the most important features of the new program: if you know how to use 1-2-3, you will find the operation of Report Writer almost obvious, although this hardly seems the right word for Lotus's labyrinthine command trees.

When you select Create, you are presented with a dummy format for your report which you can proceed to modify. Along the top of the dummy format there are the field names. These are taken directly from the column headings in the spreadsheet's first row. Underneath are representations of the type of data which will appear under the respective headings when the report is printed, and how wide the field is. Alphanumeric entries are shown by rectangular blocks, numbers by # symbols and dates by combinations of the letters D, M and Y according to the format. The various alignments such as left or right justified are also indicated. All of these can be adjusted by using the Current-Field command from the main menu, followed by the appropriate subsidiary commands.

The production of reports is a matter of deciding which of the fields of information you want where. Selection is effected by deleting any irrelevant fields. The detailed format, which is probably the most important function of report writing, is achieved in a delightfully simply way. Before moving a field you have to select it.

SPECIFICATION

Description: designed to produce neat reports from databases set up on Lotus 1-2-3 and Symphony
Hardware requirements: IBM PC or close clones with at least 256K RAM
Price: £120
U.K. distributor: Lotus Development Ltd, Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281

BROTHER TWINRITER
TWO IN ONE

By Glyn Moody

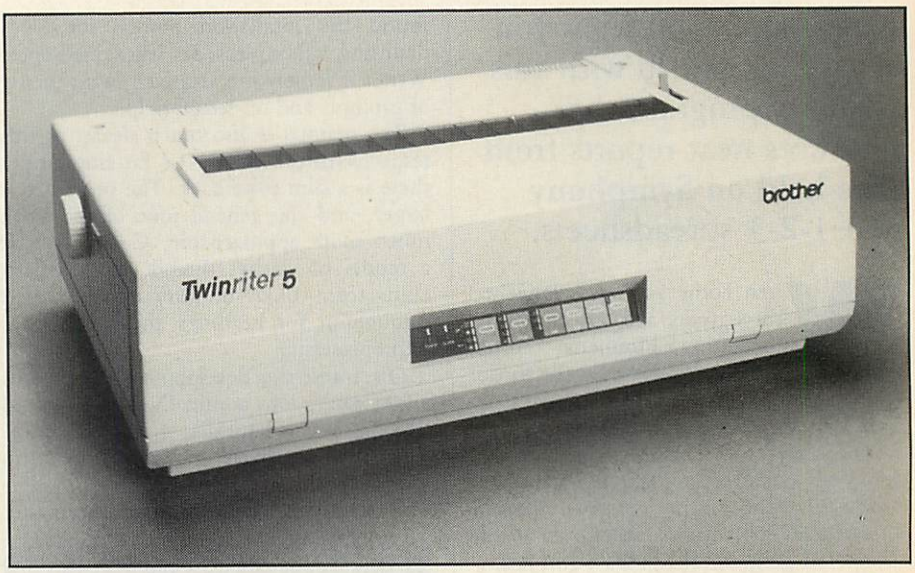
A daisywheel and dot-matrix in one, Brother's new printer can produce presentation-quality output mixing text and graphics without losing out on speed.

There is a basic dilemma when it comes to choosing a printer. Either you go for quality with a daisywheel, and lose out on draft speed, or you opt for a dot-matrix and compromise on the final appearance for the sake of throughput. To solve this dilemma, Brother has come up with the disarmingly simple idea of putting both technologies in the same box. You can even swap between them in mid-stream. But strokes of genius do not come cheap: the Twinriter costs a hefty £1,295.

The basic speeds for the machine are 30cps for the daisywheel, and 140cps for the dot-matrix. The unit is large and heavy — about 35lb. One advantage of its elephantine weight is that the high-frequency elements of the dot-matrix whine and daisywheel clatter are reduced considerably. Another benefit of its size is that it can handle A3 paper widthways. A further useful feature is the ability to handle up to four additional copy sheets.

The print head consists of a daisywheel assembly fitted next to a dot-matrix. So inserting the ribbon is slightly complicated, but well explained by diagrams on the casing of the ribbon cartridge itself.

Daisywheels are more readily changed. First the daisywheel hammer unit is pulled back, then the daisywheel cartridge, which is enclosed in a plastic case to avoid inky fingers, is removed and replaced. There are five ASCII U.K. and five IBM-compatible wheels available.



No featherweight, the Twinriter weighs 35lb. and measures nearly 2ft. wide.

SPECIFICATION

Description: dual daisywheel and dot-matrix printer
Speed: 30cps daisywheel, 140cps dot matrix
Paper feed: friction feed is standard but tractor feed and sheet feeder are available
Price: £1,275; ribbons £15 to £20
Interface: parallel with optional serial add-on
Manufacturer: Brother, Japan
U.K. supplier: Brother, Shepley Street, Guide Bridge, Audenshaw, Manchester M34 5JD. Telephone: 061-330 6531
Available: now

BROTHER TWINRITER

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	■	☐
Documentation	☐	☐	☐	■
Value for money	☐	■	☐	☐

☐ A nice idea and it works — but at a price.

At the back of the machine is a Centronics-type parallel port. A serial port can be fitted by inserting a board in a small cavity also at the rear. Next to the parallel port there are three rows of DIP switches. These control the daisywheel character set, the dot-matrix character set and the protocols of data transmission such as parity and baud rate. The section of the manual devoted to setting these switches is very clear. In fact the documentation is a model of its kind throughout.

At the front of the printer there is the main control panel which consists of six touch-sensitive switches with adjacent indicator lights. The first of these switches between DP and WP mode. The former enables the printer to respond to standard Epson codes which alter pitch, tabs, condensed mode and so on. WP uses the Diablo 630 codes. Both modes support daisywheel and dot-matrix printing.

In Diablo mode, the inclusion of the dot-matrix printer means that fast drafts can be produced from word processors which are otherwise unable to drive dot-matrix machines. The daisywheel option in DP mode is even more cunning. Since output using Epson codes expects a dot-matrix printer, there will be some characters sent to the printer which are not available on the daisywheel. These are printed by the dot-matrix, while the daisywheel handles the rest. The result is the best of both worlds, with neat alphanumeric output interspersed with graphics.

The other switches allow the pitch and line spacing to be set, as well as providing the Top of Form, Line Advance and Select.

The Twinriter proved very easy in operation. Our review machine was set up to work with the IBM PC and did so first time without any mind-bending fiddling with DIP switches. The unit is finished to a high quality, even down to the velvety-smooth turning of the platen knob.

CONCLUSIONS

■ The Twinriter is an innovative design combining a daisywheel and dot-matrix printer in one box.
■ Its biggest plus is the ability to switch from one mode to the other in mid-stream.
■ The main disadvantage is price, particularly in view of the growing numbers of NLQ machines coming through. PC

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Each user has its own 16-bit CPU iAPX186 & up to 1Mbyte of RAM and a dedicated copy of Concurrent DOS 4.1

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Each user Running:

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- 4 virtual screens/multi-tasking
- Full Concurrent DOS 4.1, CP/M86 and MS-DOS 2.11 compatibility

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- Omicron Dealers to run 16-bit multi-user
- RM Cobol and CP/M & MS-DOS Systems Houses

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Circle No. 186

OLIVETTI M-24SP
TWEAKING THE 8086

By Jack Schofield

Olivetti has risen to the challenge of the PC/AT and produced a machine which outstrips it for speed while retaining compatibility with the mass of IBM PC software.

When this magazine got a beta-test prototype of the Olivetti M-24 almost two years ago, we knew it was something special. It ran more than twice as fast as an IBM PC, and we also liked the way it ran graphics software on the same screen as monochrome software; our IBM doesn't, and now sports two drivers and two separate monitors. As a bonus, the M-24 was cheaper than an IBM PC.

Some nine months later IBM launched the PC/AT, built round the powerful Intel 80286 chip. The AT's performance was very little better than the M-24's — and herein lay Olivetti's problem. If it was to launch an 80286-based machine, it too could offer only a slightly better performance than the M-24, but at a significantly higher price. Instead, Olivetti has elected to stick with the standard M-24 design, but tweaked it here and there to enhance the performance.

The result is the M-24SP. But where you can buy the M-24 in a range of sizes, starting with a single-floppy model with 128K of RAM, the SP comes with a fixed specification. You get a standard box fitted with 640K of RAM — the limit accessible to PC-DOS — a 320/360K floppy-disc drive, a 20Mbyte hard disc and a bus expander for adding expansion cards. In addition, the review sample was supplied with an IBM PC compatible keyboard, mouse, DR Gem software, a colour monitor and Olivetti's EGC enhanced graphics controller card.

The M-24SP's 8086 CPU runs at 10MHz, compared to the 8MHz of the M-24 and the 4.77MHz of the IBM PC. This is what makes the M-24SP even faster than 6MHz IBM PC/AT, though there is no provision for slowing it down to cope with any speed-sensitive software.

In addition, the SP has no wait states in the RAM access cycle, a 5MHz direct memory access (DMA) channel instead of a 4MHz one, and 3-1 interleaving of disc sectors instead of the usual 6-1. This means the processor gets data more quickly from memory and disc, and it all adds to the speed of the machine.

As well as standard IBM-compatible graphics of 640 by 200 pixels, the SP, like the M-24, also offers a 640-by-400 mode which can be displayed on the standard monitor. The EGC, if fitted, adds a further three 32K 640- by 400-bit planes, making four in all. The resulting 16-colour display drives the standard colour screen; it is not compatible with the IBM PC's enhanced graphics adaptor.

Though the M-24SP is an IBM PC look-alike, there is no comparison on performance. To all intents and purposes, the SP offers the same performance as the IBM PC/AT, but with far better compatibility with IBM PC software. With some software it seems to run a bit faster; with other software slightly slower. The one area where the PC/AT may have the edge is in the performance of the hard disc: the AT seems subjectively faster, but we have not benchmarked it. Of course, should any software appear that requires AT compatibility, it may be a different story.

The M-24SP really shows its paces when the EGC is used. Not only is it much more convenient than the IBM PC option, it is really fast, where the IBM EGA is painfully slow. There is no contest: the Olivetti product seems far superior.

Of course, getting software that uses the EGC could be a problem. However, the number of packages written for the IBM EGA is so small as to be hardly worth bothering about, and Olivetti can probably get conversions of the major ones. Enhanced versions of DR Gem and Autodesk's Autocad have already been completed.

OLIVETTI M-24SP

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	■	☐	☐
Ease of use	☐	■	☐	☐
Documentation	☐	☐	☐	☐
Value for money	☐	■	☐	☐

☐ If you are in the market for a high-spec, high-performance PC-compatible, the M-24SP delivers the goods.

SPECIFICATION

CPU: 8086 running at 10MHz
Memory: 640K RAM; 8K ROM with bootstrap and diagnostics
Mass storage: one 360K floppy drive, one 20Mbyte Winchester
Standard interfaces: Centronics parallel printer interface; RS-232 serial port
Keyboard: option of IBM PC layout or 96-key Olivetti layout
Dimensions: 380mm. (15in.) x 375mm. (14.8in.) x 165mm. (6.5in.)
Options: mouse, DR Gem software, colour monitor, enhanced graphics controller
Expansion options: space for seven IBM cards
Price: basic unit £3,617 plus VAT; typical system price, including monochrome screen, keyboard and DOS £4,055
U.K. distributor: British Olivetti Ltd, Olivetti House, PO Box 89, 86-88 Upper Richmond Road, London SW15 2UR. Telephone: 01-785 6666

BASIC BENCHMARKS

The standard Basic Benchmark routines — see *Practical Computing*, January 1984 page 102 — show the M-24SP comfortably ahead of the IBM PC/AT.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Olivetti M-24SP — 8086	0.4	1.5	3.5	3.6	3.9	7.2	11.2	12.5	5.5
IBM PC/AT — 80286	0.5	1.9	4.6	4.7	5.2	9.1	14.6	13.5	6.8
Olivetti M-24 — 8086	0.5	2.0	4.6	4.7	5.2	9.4	14.8	16.1	7.2

CONCLUSIONS

- The M-24SP delivers the speed and power of an IBM PC/AT, insofar as the latter is considered as a PC-type micro.
- The M-24 itself is already so superior to the standard IBM PC that the extra benefits of having the SP version are marginal.
- The M-24SP should only be considered by people who want both a high-performance machine and a fully specified one, with a minimum of 640K of RAM and a 20Mbyte hard disc. PC

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QED+	**200** RRP	295	**–32%!**
WORD	**274** RRP	400	**–31%!**
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Basic Compiler	270	385	30%
C Compiler	345	485	29%
MACINTOSH SOFTWARE			
Lotus Jazz	320	450	29%
Excel	295	395	25%
Multiplan	145	190	24%
Microsoft Word	145	190	24%

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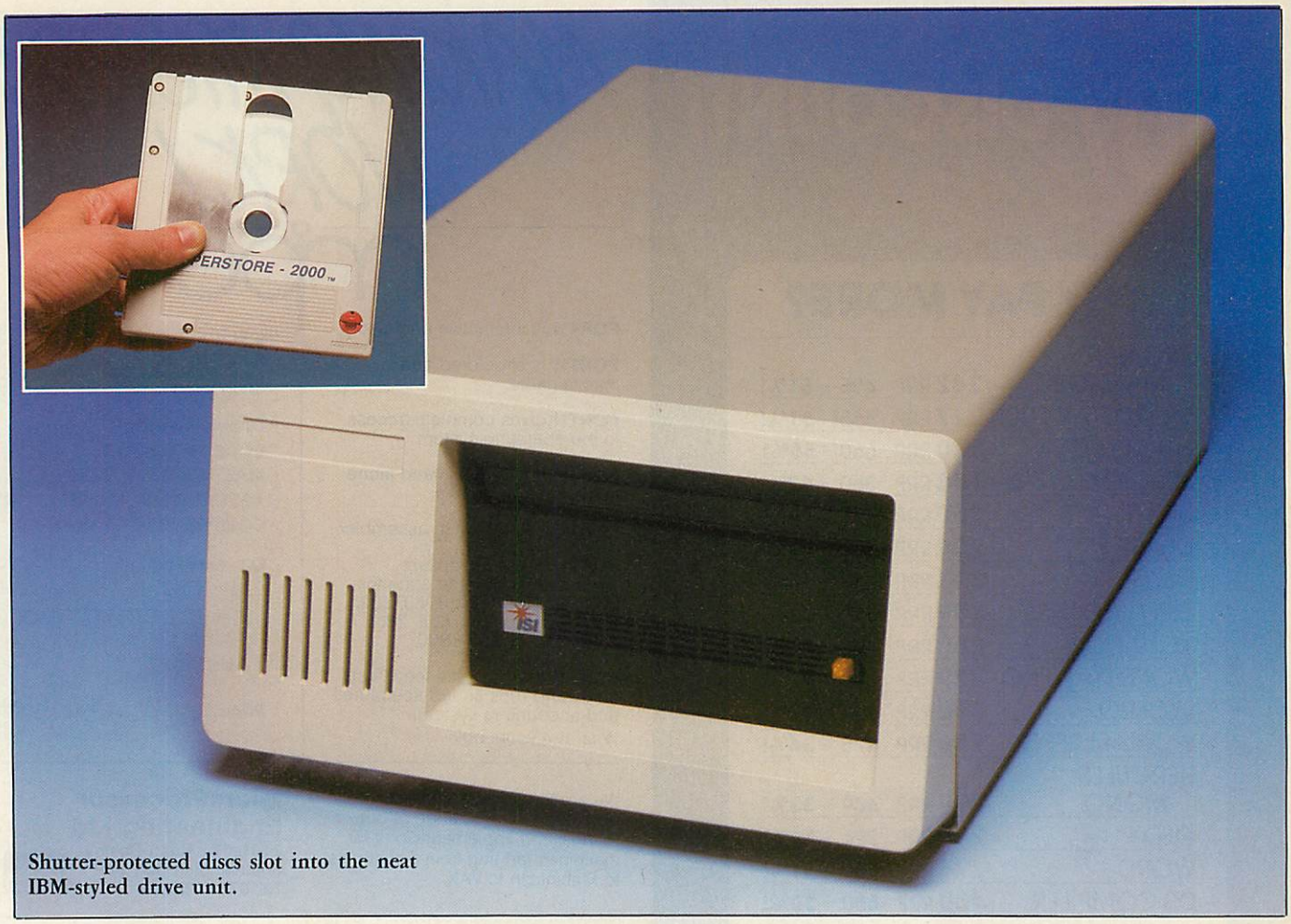


Shutter-protected discs slot into the neat IBM-styled drive unit.

are identified after manufacture, and recorded on a bad-sector map. There is also a verification procedure at the time of writing to check that the process was successful. If necessary, the writing is repeated. The maximum number of files and directory entries on a disc is 65,535. The maximum length of any MS-DOS file is 32Mbyte.

In practice the Worm drive is even easier to use than the description indicates. As files are copied to disc there is a gentle beep and some brief activity on the disc drive. Loading is fast — at least as good as a Winchester. The discs themselves are enclosed in a rugged plastic casing with a firmly sprung shutter to protect the slots which give access to the recording medium. They could easily be sent through the post. In addition to manual ejection, there is also a software eject option.

MASS MARKET

When optical discs first came out, they looked interesting but of little relevance to the professional micro user. Now the market is splitting into two quite distinct sectors. On the one hand there are the mass market CD-ROMs with a capacity of about 500Mbyte, which look as if they will first appear on the Atari 520ST. These seem to lie very close to the heart of Jack Tramiel, who is intent on selling drives for around £500. By their very nature, they will cater for the mass market and provide such things as encyclopedias and dictionaries in a very compact, easily accessible form. Eventually this technology will percolate through to the business user in the form of standard works of reference, current legislation, tables of data and suchlike.

The other approach is represented by the Worm systems. At the kind of price levels now being offered, any firm with archiving requirements can afford to do away with fragile Winchesters, slow tape streamers and inconvenient floppies. Backing up Winchesters on to a Worm disc is quick and easy and, more importantly, it is safe and relatively permanent. Currently the technology imposes a lifetime of about five years on the write life and 10 years on the read life of the disc cartridges. This is due to tiny defects growing in the tellurium surface of the disc. Since old versions of files are never destroyed, there is a perfect audit trail which makes it ideal for business. At around £1 per megabyte, the medium is as compact and cost-effective as any of its rivals.

Even these prices look like coming down. Apart from Information Storage Inc., other players in the market include Toshiba, Verbatim and Optimem. I would expect to see a pattern of price cuts along the same lines as those that have occurred in the burgeoning laser-printer market — another example of an advanced technology answering a hitherto unsuspected demand.

With the advent of Worms, the whole disc equation of floppies for immediate needs and Winchesters for long-term filing has moved on a stage. Now you can afford to use fast Winchesters for day-to-day needs, backing up archive files on to optical discs. Although fully erasable discs are likely to follow in due course, they will have less impact. The key development is the provision of gigabytes — and perhaps soon terabytes — of writable on-line storage. With over 1,000Mbyte available, erasing or throwing files away will be a thing of the past. Business will never be the same again.

ISI-525

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	☐	■
Documentation	☐	☐	■	☐
Value for money	☐	☐	■	☐

☐ An exciting product which is easy to use and offers an excellent performance for the price.

CONCLUSIONS

- The ISI-525 is an easy-to-use high-capacity mass-storage unit that could transform the way businesses store and use data.
- The unit is simple to install, compact and at £3,450 cheap at the price.
- The fact that it is not a truly permanent medium is a minor but slightly inconvenient limitation. PC

REVIEW

ISI-525 OPTICAL DISC DRIVE

THE WORM TURNS UP

By Glyn Moody

The write once read many times disc is here — and it could change the way that businesses look at their data-management problems.

The ISI-525 from Information Storage Inc. is a write once read many times — Worm for short — laser disc which hooks up to IBM PC/XTs and compatibles. Digital data is stored as a series of microscopic pits burnt into the surface of the disc by a small laser, which also acts as the reading device.

As well as being one of the first such units to be generally available to the micro user, the ISI-525 is notable for the price-performance it offers: the drive costs £3,450, and a 100Mbyte writable disc costs £120. A flippable double-sided version with over 200Mbyte of storage will be available for under £200. For advanced technology of this kind it is also remarkably easy to use.

5.25IN. DISCS

Several different physical configurations will be available, including one which will sit inside the IBM systems box like a conventional disc drive. The review unit came in a separate case styled to match the IBM PC. Its compactness derives in part from the use of a 5.25in. disc as against the 12in. versions favoured until recently by manufacturers such as Optimem and Shugart — see January 1984's *Practical Computing* for a preview of an early read-only system using the larger format.

Apart from the drive unit itself, the add-on box contains an independent supply and two IBM cards with their disc controllers. The peripheral is connected via a hefty cable to a half-size card placed in one of the IBM's expansion slots. This constitutes the only hardware installation necessary. The heavy cabling is required to shield the IBM bus carried within, potentially a powerful source of radio frequencies. The manufacturer hopes shortly to place all the circuitry on just one full-size card that will sit inside the micro.

The software installation is equally straightforward. As well as an XT or equivalent, you need MS-DOS 2.0 or above and at least 128K of RAM. To run the Worm drive you simply add a couple of commands to MS-DOS to handle the extra facilities. These commands form Isdos, which is supplied on a floppy disc. Copying them across puts the command Isbios.Com in the file Config.Sys. When you boot your system, Isbios.Com is run automatically and the Worm drive is installed.

The basis of operation is wonderfully simple. On a standard XT system, where the floppy-disc drive is A, and the Winchester C, the Worm drive is accessed as drive D. Only one Worm drive may be hooked up at a time. In most respects, it acts like any other drive, and can be used from within any program with the caveat that many programs treat a request for drive D as an error, and hence refuse to comply. Otherwise, files can be loaded from it directly, using the usual commands.

Copying files to the Worm disc is slightly more of a problem. The ordinary Copy command will not do, since Worm files cannot be erased and it is consequently not possible to overwrite old files with new versions. Instead, a version number is assigned to successive copies, and for this a modification of Copy, called Iscopy, is used. The usual syntax associated with Copy still applies.

There is also a slight problem with DOS's Dir command. The structure of MS-DOS is such that it cannot request data beyond a 32Mbyte limit. Using the Worm disc, it is quite possible to exceed this apparently generous allowance. Files must therefore be subjected to a process called mounting before they can be read using the Dir command. This is rather like setting up a data window which is limited to 32Mbyte of total capacity, within which MS-DOS can work quite happily.

Invoking the Mount command calls up a display of all the files stored on the Worm disc. On each screen there are a maximum of 32 entries; the following and previous screens can be accessed using the Pg Up and Pg Dn keys on the IBM keyboard. Files are mounted by first selecting them using the cursor keys, and then pressing f1; files can be unmounted by pressing f2. It is also possible to use standard mice in the selection process.

```
File Name   M     Size    Date    Rev
LABEL       .         41  1/01     0
MOUNT   .COM      13389  1/01     0
MOUNT   .COM +    13389  1/01     1
ISCOPY  .COM +     7137  1/01     0
ISDIR   .COM +    10047  1/01     0
ERRPRT5 .COM +      222  1/01     0
DIRCLR  .COM +      254  1/01     0
ISBIOS  .COM +    19390  1/01     0
CONFIG  .SYS         19  1/01     0
INSTALL .BAT +       90  1/01     0
EJECT   .COM +      120  1/01     0
GROUP          <DIR>     1/01
BASICA  .COM +    25984  1/01     0
WPFEAT  .DOC      20352  1/01     0

   121.938  Megabytes free

Current Directory = GROUP
```

Invoking the Mount command displays the mounted files on the Worm disc.

When files have been mounted, the ordinary Dir command can be used to view them. Typically, a group of mounted files would be related in terms of content and used together in a working situation. Such groups are set up for using a modified Iscopy command. Typing

ISCOPY EXAMPLE/D

creates a directory called Example containing all the currently mounted files. Subsequently the command

MOUNT EXAMPLE/D

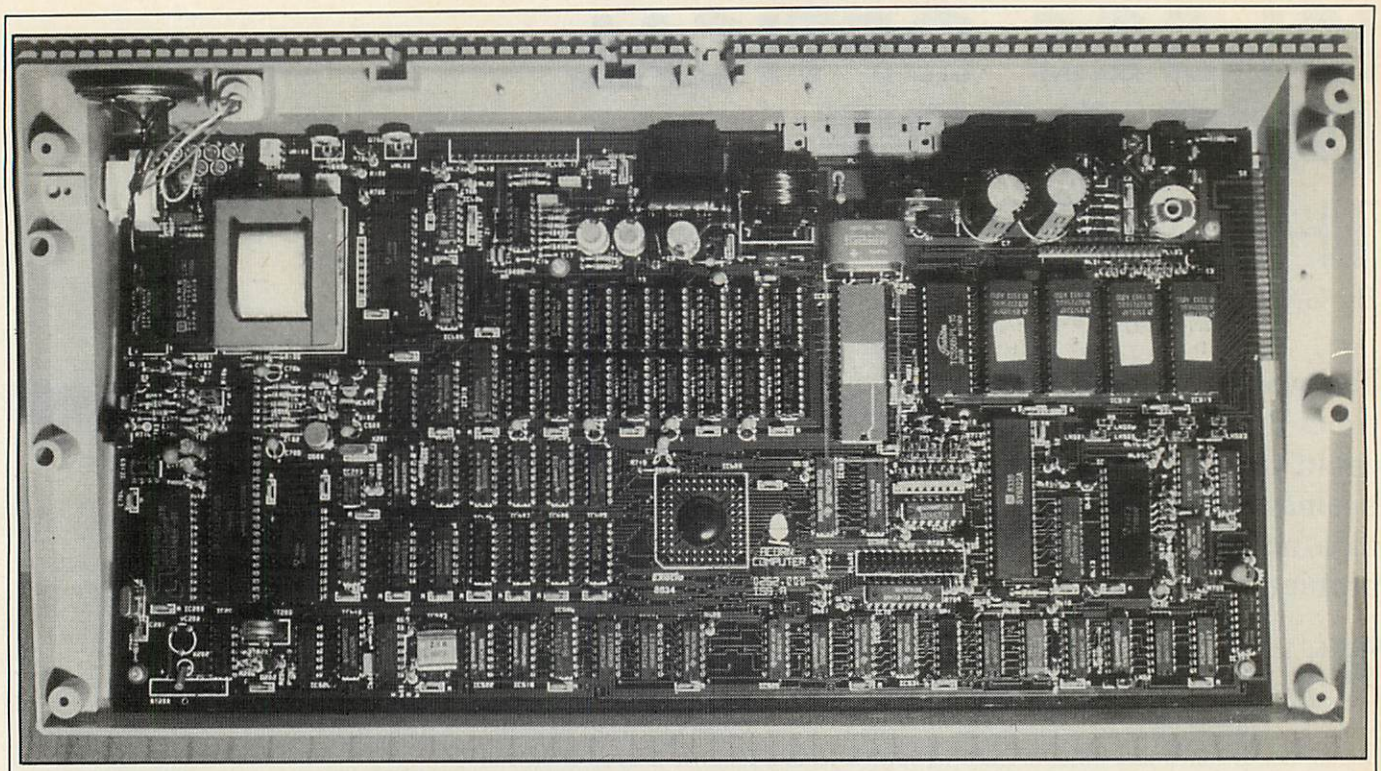
mounts all the files contained in that directory without the need to specify them. In this way several mounted directories can be set up in advance, allowing commonly used groups of files to be accessed together.

These mounted directories are quite distinct from the main directory of the disc. In fact, for security there are two main directories stored: one is placed on the outermost available track and the other is placed at the end of each file as it is saved. The files themselves are saved on the innermost tracks working outwards.

Altogether there are an astonishing 15,000 tracks on a single-sided disc, each with 32 sectors of 256 bytes. This provides an unformatted capacity of about 177Mbyte, with a guaranteed formatted capacity of at least 100Mbyte; in practice this works out at something more like 120Mbyte. Bad sectors

SPECIFICATION

Formatted capacity: at least 100Mbyte single-sided, 200Mbyte for double-sided
Data-transfer rate: 2.5Mbit/s.
Average access time: 200ms.
Rotational speed: 1,800rpm; mean time between failures: 15,000 hours
Power requirement: 20 watts
Price: £3,450 for disc drive; £120 for 100Mbyte disc
Manufacturer: Information Storage Inc., Colorado Springs
U.K. distributor: CPU Computers plc, Copse Road, St. John's, Woking, Surrey GU21 1SX. Telephone: (04862) 73883
Availability: now



THE 65816 CHIP

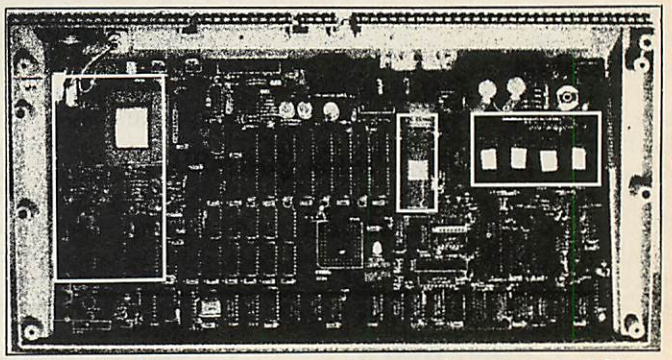
One of the problems with a rapidly advancing art, such as computing, is that each new step presents a dilemma: should you make a fresh start with a clean slate, or should the existing system be upgraded. With the Intel series of microprocessors, there has been a clear upgrade path. The eight-bit 8080 gave way to the 16-bit 8086 and eight/16-bit 8088; these were in turn replaced by the 80186 and the 80286 and will be followed, in due course, by the 80386. In each case, the instruction set and programming techniques of the new chip were compatible with those of the predecessor, so that new software could be written by adaptation and development of that which already existed.

This option has not hitherto been possible with systems based on the 6502. Although there are family relationships with the eight-bit 6800 series and their successors, the differences are sufficiently marked to make it necessary to go back virtually to square one and start again. Memory expansion of 6502-based systems has been achieved by techniques such as bank switching and RAM-disc simulation.

The introduction of the Western Design Centre 65816 has changed matters, since its instruction set is a superset of the 6502's and it can operate in a 6502-emulation mode. Like the 8088, it is a full 16-bit microprocessor internally, but the external data bus is eight-bit. It is housed in a 48-pin dual in-line package which is pin-compatible with the 6502.

Eight-bit operation is adequate for many data-processing applications — in particular those not involving floating-point mathematics — but one major drawback of the 6502 is its limitation to a 64K address space, the result of its having only 16 address lines. The 65816 overcomes this problem by having a 24-bit address bus, which gives a direct addressing capability of 16Mbyte. This is made possible, while retaining the 6502 48-pin encapsulation, by multiplexing the additional eight address lines with the data bus.

The internal register structure is based on 6502 architecture, with 16-bit registers substituted for eight-bit registers. Programming compatibility is achieved by structuring the address space in 64K blocks and providing further eight-bit extensions to the program counter and index registers for bank selection. The new direct register extends the concept of zero-page addressing, by providing a start address for the direct page anywhere within bank 0. The accumulator and index registers can operate in either eight-bit or 16-bit mode, selection being made by appropriate flags in the status register. A ninth flag, E, indicates whether the processor is acting in 16-bit mode or is emulating a 6502. This flag cannot be accessed directly, but can be swapped with the carry flag for read or write purposes.



As is standard Acorn practice, the Communicator's single PCB occupies the full area of the casing. Its most significant innovation is the use of the 16-bit 65816 CPU chip, highlighted in the diagram above just off-centre. The 65816 has a 6502 emulation mode, so the Communicator starts life with a ready-made software base. Up to 512K of ROM is supported (highlighted at the right of the board). The main PCB also carries full comms hardware, including an autodial modem (highlighted left).

Like that of the CMOS 65C02, the instruction set of the 65816 permits direct transfers between the index registers and the stack. There are eight instructions which permit new types of stack access. Five of these transfer registers to and from the stack and the other three transfer computed data to the stack or pull it to one of the registers. Instructions are provided for direct control of the hardware: the COP instruction supports co-processors and STP stops the system clock. Provision is made for block moves with MVP and MVN, which move data higher or lower in memory.

The 6502 supports vectors at FFFE-F for IRQ/BRK, at FFFC-D for Reset, and at FFFA-B for NMI. The 65816 supports three further vectors: at FFF8-9 for Abort, at FFF6-7 for BRK in 16-bit mode, and at FFF4-5 for co-processor routines. The 65816 extends the 6502 addressing modes to accommodate 24-bit addresses and 16-bit data, where appropriate, and expanded stack addressing modes are provided for the new stack-manipulation instructions. PC

(continued from previous page)

Telecom jack socket. It supports full bi-directional communications and operates at data baud rates of up to 19.2Kbaud, selected under software control. A Centronics interface is provided for printer connection, and an Econet interface for a local area network.

The standard unit has no file-storage facilities; archiving is accomplished by way of the Econet file server. Acorn has designed a smart 1.2Mbyte twin double-density 3.5in. disc-drive unit for this purpose, controlled by what is, in effect, a built-in cut-down BBC B+ Micro with 6512 processor, 1770 floppy-disc controller, 64K of paged ROM and 64K of RAM. It has a Centronics interface and printer-server firmware which permits the spooling of files for printing. The filing system is Acorn's standard Advanced Network Filing System (ANFS), which supports a hierarchical file structure with up to 47 files per directory.

HARD DISC

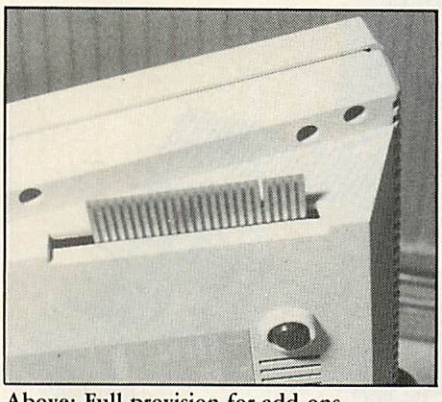
An Acorn 20Mbyte hard-disc unit may be connected to the disc unit via a 1MHz bus connector; alternatively, one of the floppy drives may be replaced by a 3.5in. hard-disc unit. The file server incorporates its own battery-powered clock to provide automatic date and time stamping, and which can also act as the network clock. On reset, the file-server operating system searches for an external clock, and if it does not find one it installs its own.

The size of the main printed-circuit board, and hence the number of facilities which could be provided on the basic unit, is constrained by the footprint requirements of the external housing. The motherboard follows normal Acorn practice and is a high-quality four-layer PCB.

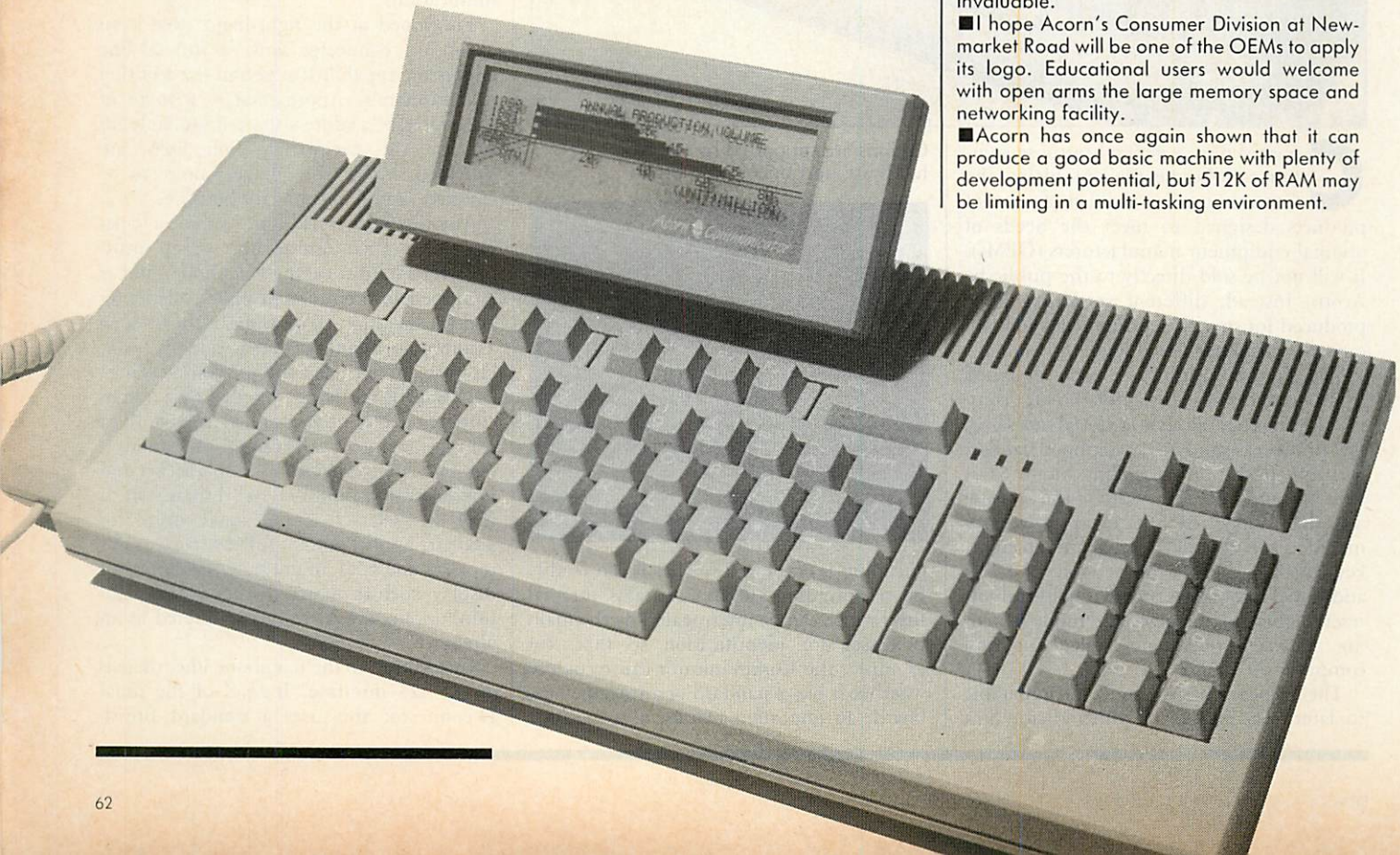
The main innovation is the 65816 processor which drives up to four socketed 128K ROMs, two banks of dynamic RAM and 32K of CMOS RAM with battery backup. The dynamic RAM may be in the form of 64K or 256K chips to give from 128K to 512K of core store. Eventually, 1Mbyte chips could permit this capacity to be further extended, but for the time being additional memory can only be provided by means of an expansion unit. A switching power supply derives d.c. voltages from the 21V a.c. input. There is a single 6522 versatile interface adaptor (VIA) chip for serial and parallel I/O.

The entire left-hand side of the PCB is occupied by an autodial modem, providing pulse or tone dialling and operating entirely under software control. A battery-backed clock serves as a calendar and time-of-day indicator. A large ULA chip controls the video display and keyboard circuitry and acts as a sound-cassette modem.

The standard video display emulates BBC modes 0 to 6 only, since there is no 5050 teletext chip. A monochrome version of the BBC's mode 7 is, however, emulated in the mode 0 display. To provide full-colour teletext the computer may be fitted with a software-controllable Super Teletext daughter board, complete with UHF input and tuner, which plugs into a connector on the motherboard. Screen memory occupies half of one 64K bank of the 65816 address space. The LCD interface supports a 256- by 64-pixel screen, which may be a window of the main display or totally separate.



Above: Full provision for add-ons.
Below: Several LCD screens can be used.



BBC SOFTWARE

The 65816 chip has an eight-bit 6502 emulation mode and shares many of the 6502 instructions and addressing modes. It has therefore been possible to use the software of the BBC Micro as a starting point, since the code could quickly be translated to 16-bit format. The current version of the operating system permits a task to be interrupted and then resumed after an intermediate task has been executed, but this will shortly be replaced with a full multi-tasking operating system which supports foreground and background tasks and a windowing facility.

The Communicator is supplied with the 1983 65C02 version of BBC Basic. There is also an option of the View Suite ROM, which provides a comprehensive range of applications software; VT-100 emulation is also available. For the benefit of its OEM customers, Acorn has prepared a comprehensive set of instruction manuals as well as full 65816 software-development tools.

CONCLUSIONS

- Definitely a must for the Yuppy. Users such as information providers, government departments and service industries will also find it invaluable.
- I hope Acorn's Consumer Division at Newmarket Road will be one of the OEMs to apply its logo. Educational users would welcome with open arms the large memory space and networking facility.
- Acorn has once again shown that it can produce a good basic machine with plenty of development potential, but 512K of RAM may be limiting in a multi-tasking environment.

ACORN COMMUNICATOR
OFFICE WORK STATION

By Roger Cullis

In the wake of ICL's unexpected success with One Per Desk, Acorn unveils a new micro with ample comms facilities which could appeal to an even wider market.

SPECIFICATION

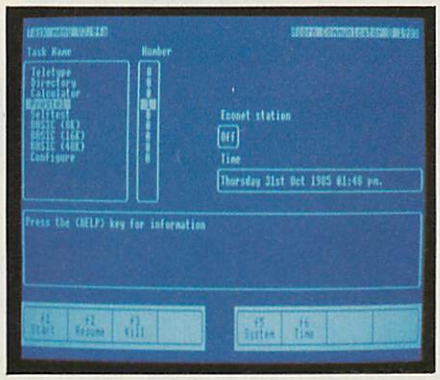
CPU: Western Design Centre 65816
Memory: 128K or 512K dynamic RAM, 32K battery-backed CMOS RAM, four 128K ROMs
Ports: RS-423 serial and Centronics parallel, fully buffered expansion socket, RGB/composite video LCD interface; optional viewdata expansion card
Telephone facilities: line-powered handset, autodial modem
Display: colour monitor, optional LCD
Sound: integral speaker
Mass storage: none built in; available via Econet file server providing twin 600K 3.5in. floppy drives or one floppy and one 10Mbyte hard disc
Price: end-user price likely to be in the range £1,000 to £1,500, according to configuration
Supplier: Acorn Computers Ltd, Fulbourn Road, Cherry Hinton Cambridge CB1 4JN. Telephone: (0223) 245200
Availability: to OEMs only

Conceived as a general-purpose solution to other people's problems, the Communicator is the first of a line of products designed to meet the needs of original equipment manufacturers (OEMs). It will not be sold directly to the public by Acorn. Instead, different versions will be produced for specific requirements and will carry the customer's own logo.

The Communicator has been designed from scratch as a state-of-the-art communications engine. It is enclosed in a sleek, low-profile case and has a telephone handset with full push-button dialling mounted at the left-hand side. The width of the housing was determined by the need to accommodate a full QWERTY keyboard, an eight-key cursor pad and a numeric keypad. An additional row of keys provides help and soft reset, eight function keys, and mode switching between telephone, calculator and computer operation.

The keyboard has a firm feel, comparable to later versions of the BBC Micro. Soft

Comms are supported by the basic hardware and operating system.



encoding is employed so that it can readily be reconfigured. It also contains integral links which can be interrogated by the main processor for identification so that, for example, the Communicator can recognise whether it has a standard or an Arabic keyboard, an important feature in a machine likely to be used for remote communications.

Positioned at the right-hand edge is an expansion connector with a full 24-line addressing capability to permit the addition of peripherals. Approximately 8Mbyte of the processor's address space is available for use by the peripheral. Bolt holes are provided so that the auxiliary unit can be coupled rigidly to the main housing.

The first of these add-ons is to be a logic-controlled microcassette unit which incorporates a loud-speaking telephone, and is equipped for unattended phone answering and for dictation. It provides facilities such as automatic dialling from an address book, electronic mail, telex and teleconferencing.

Display is normally provided by a monochrome or colour monitor driven by RGB or composite video. Maximum resolution is 640 by 320 pixels. There is also a socket and interface for a liquid crystal display, which may be selected from small units for auxiliary applications or full A4 size where it replaces the CRT monitor. Other forms of display, such as plasma discharge or electroluminescent tubes, could be offered as an alternative.

In addition to the telephone line, there is an RS-423 interface. Instead of the usual D-connector this uses a standard British

(continued on next page)

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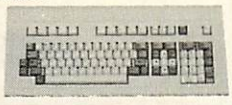

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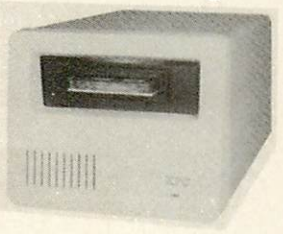

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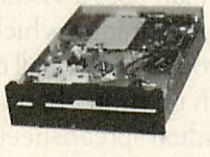

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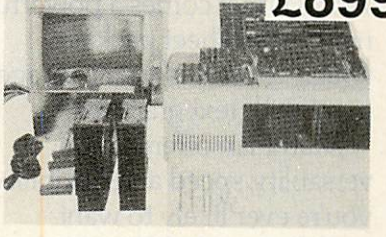

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BAGSHAW BENCHMARKS

	BM0	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	BM9	BM10	BM11	BM12	BM13	Total
Apricot Xen — 20Mbyte	0.4	1.8	2.2	2.9	3.5	5.3	0.5	5.5	0.6	1.5	2.7	15.7	10.0	6.3	58.8
Compaq Deskpro 286 — 30Mbyte	6.2	1.8	2.5	2.3	2.8	3.6	1.2	3.8	1.1	0.8	1.6	11	5.9	3.2	47.8
Apricot Xen — 720K	1.5	3.8	3.1	14.8	13.5	24.1	0.5	24.6	0.6	4.6	10.9	49.4	28.9	8.6	188.6
Compaq Deskpro 286 — 360K	10.5	4	4	12.5	15	16.4	5	17.5	5.3	8	13.4	75	45.5	18.2	250.3

The Bagshaw Disc Benchmarks confirm the Xen's superlative performance. For details of the routines see July 1985 issue, page 99.

(continued from previous page)

the commands. Apricot is confident that the versions shipped will have most of these problems cleared up.

In use, Windows is very fast. But working with the product for the first time and without manuals — Apricot was unable to supply them in time for review — I did not find it user-friendly. However, I preferred it to Digital Research's Gem.

Apricot is continuing to support Gem, but only on its low-end machines. It remains to be seen how the fracas with Apple, reported in last month's *Practical Computing*, will affect the overall appearance and working of the latter product. I would not be surprised if Gem is dropped and replaced by Windows throughout. The recent blessing given by IBM to the product — which is nominally in direct competition with its own Topview — seems likely to hasten its acceptance.

One bundled software package which was unfortunately unavailable for review was the IBM ROM BIOS emulator. This is one of Apricot's few concessions to what might seem to be an unavoidable fact of micro life: IBM compatibility.

The Apricot Xen does not run IBM software but it does offer two kinds of IBM compatibility. The first is data compatibility, which allows files to be swapped from an IBM machine to the Apricot. For example, when running Lotus 1-2-3 on both machines you can exchange data betwen them. But even this is problematic since the Apricot uses the superior but non-standard 3.5in. discs. To get round this, Apricot offers a 320K 5.25in. drive using the IBM disc format.

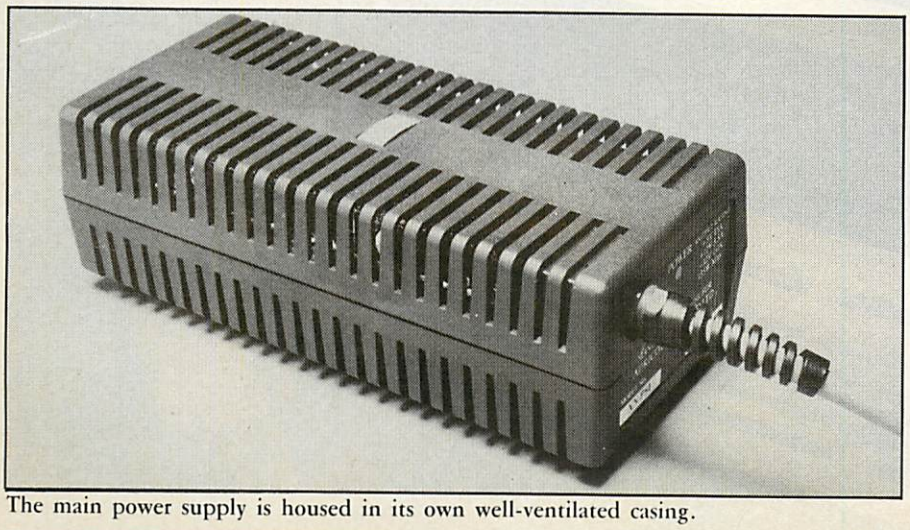
Another route towards IBMulation is via an add-on expansion box which provides two slots for either IBM PC or AT cards. It allows Xen users to tap the vast range of specialised boards available. In this respect Apricot is being very reasonable in not expecting add-on manufacturers to rush out and convert everything to the Xen formats.

Of course there is a price to pay for this limited IBM compatibility in so far as it introduces some incompatibility within the Apricot family itself. The IBM expansion board add-on unit has been accommodated by using a technique known as port-mapping. The Xen addresses certain functions, such as initial boot routines and the handling of serial and parallel data transer, in a different way to earlier machines. Screen and microscreen handling are unchanged.

NOT QUITE COMPATIBLE

The Apricot programs likely to be affected by such changes are comms packages which will be disappointed when they look in particular locations for specific functions. On the IBM front, this port mapping will fail with those programs, like Lotus 1-2-3, which check the hardware.

Apricot has not called its 80286 machine Xen for nothing: the company has announced its intention of releasing Xenix for it in 1986. But the question arises as to just how serious the company is about this particular flavour of Unix. For a long time Unix has been touted as the micro operating system of the future. It is particularly well suited to multi-user operation, and the entrance of IBM into the micro Unix market in a big way could give it the kick it needs. Also it might enable the Xen to pick up IBM compatibility without really trying, solving many of its problems at a stroke. Perhaps Apricot knows something we don't.



The main power supply is housed in its own well-ventilated casing.

It is paradoxical that a company which has been so prodigal with its products needed a new one as badly as Apricot needed the Xen. At the bottom end of the market it offers the F series and the ugly duckling of the family, the Portable. Then there are the popular PC products which have been the mainstay of the series. Finally there is a host of file servers and local area network products. However, with the introduction of the IBM PC/AT in 1984, the Apricot family has been left looking long in the tooth.

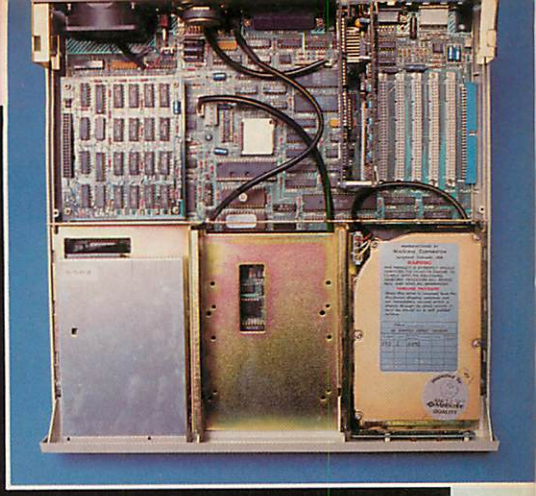
Apricot claims that the new machine offers the performance of the PC/AT for the price of the PC/XT and regards it as a competitor for the latter. However, the hard-disc version of the Apricot PC, the XI, meets the challenge and has proved very popular with business users. So it is curious that the company should slant its new machine down-market from its obvious niche and in apparent competition with one of its own products.

The biggest worry is that by sticking with MS-DOS Apricot is going to get left behind. It is in an impossible position, since Apricot must strive to retain compatibility within the Apricot family and its many loyal users, yet it wants to move more in the direction of the IBM PC.

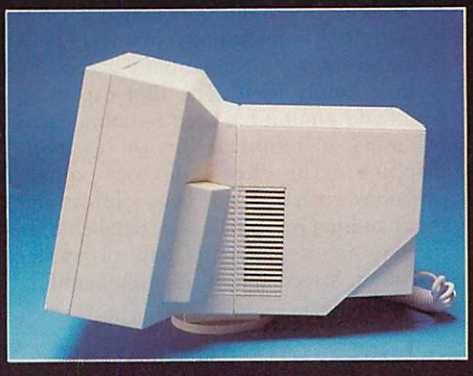
Perhaps IBM will announce its full backing for Xenix and perhaps too there is enough slack in the U.K. corporate micro market to take up the Xen. But the danger is that the policy of buying IBM-only will have spread too far. I hope not: the Xen is a beautiful machine, and deserves to succeed. Whether it does or not remains to be seen.

CONCLUSIONS

- The Xen is a very fast 80286 machine running under MS-DOS. Microsoft's Windows is bundled with the machine as a user-friendly front end.
- Surprisingly, only limited IBM compatibility is offered. It remains to be seen whether this is a fatal flaw.
- The price is very competitive for the hardware offered. All parts of the unit are finished to a high standard.
- Apricot has regressed to a separate power unit which stands on the floor. This may be inconvenient but it does mean that the main systems box is exceptionally light and slim.
- At last Apricot has provided a keyboard worthy of its machines. It includes a microscreen, and a mouse option.
- The telephone-manager system, not available for review, is potentially a big plus for the machine and could be a key element during the next year.
- The possibility of running the multi-user Xenix operating system might turn out to provide it with the IBM compatibility it now lacks. PC



The Xen is an exceptionally light and slim machine, engineered and finished to high standards.



SPECIFICATION

CPU: 80286 running at 7.5MHz
RAM: 512K expandable to 1Mbyte
ROM: 64K bootstrap and diagnostics
Dimensions: main unit 380mm. (15in.) x 370mm. (14.5in.) x 105mm. (4.2in.); keyboard 195mm. (7.7 in.) x 465mm. (18.3in.) × 55mm. (2.2in.)
Weight: main unit 6kg. (13.2lb.); keyboard 1.75kg. (3.8lb.); power-supply unit 3kg. (6.6lb.)
Display: 80 columns by 25 lines, 800 by 400 pixels maximum resolution on white monitor; 640 by 350 pixels and 16 colours on high-resolution monitor; 640 by 200 pixels and four colours on standard monitor; two-line 40-character back-lit LCD
Keyboard: full QWERTY, 10 function keys, further six microscreen keys, numeric keypad, separate cursor pad
Mass storage: two 720K 3in. floppies on entry-level machine; upgrades include one floppy and 20Mbyte Winchester
Interfaces: RS-232 and Centronics ports; mouse, phone set and microphone ports
Software in price: MS-DOS 3.1, GWBasic, IBM ROM BIOS emulator, asynchronous communications
Software options: Xen-Com communications package
Hardware options: IBM expansion-card unit, 5.25in. 320K floppy drive, 80287 co-processor, mouse
Price: entry-level system £2,490 with one floppy, 512K RAM, keyboard and green monitor; 20Mbyte Winchester version with 1Mbyte RAM, keyboard and white screen £4,885; IBM expansion card box £195; 5.25in. floppy £295; Xen-Com package including telephone £395
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Availability: now

REVIEW

APRICOT XEN
NOT AN AT-EMULATOR

By Glyn Moody

The U.K.'s leading business micro manufacturer goes it alone again with this fast, well-engineered and keenly priced 80286 machine.

The Xen is Apricot's long-awaited top-of-the range model, based around the 80286 chip used by the growing ranks of IBM AT-alikes. Apart from its excellent engineering, top-flight performance and competitive price, the most interesting things about the Xen are that it is not aimed at the PC/AT but the PC/XT, and that it is not IBM compatible.

The entry-level system comes with 512K RAM, two 3.5in. 720K floppies, serial and parallel ports, keyboard, green screen, MS-DOS 3.1 and Windows, and costs £2,490. The £4,885 20Mbyte Winchester version with 1Mbyte RAM and white screen is reviewed here. Upgrade options include up to 5Mbyte of RAM, a tape streamer and an 80287 maths co-processor. In addition to MS-DOS, Xenix should be available in early 1986.

The appearance of the Xen is characteristically neat. Traditionally, Apricot has turned in tightly designed packages which often take up far less space than their competitors. Unfortunately, this time it has cheated. The very light and slim unit is possible because there is a separate power unit, which sits on the floor. In principle there is nothing wrong with this approach; but one drawback is that the power unit has numerous ventilation slots which are crying out to have coffee spilt into them.

The design of the systems unit is similar to those in the F series with a stepped top. On the hard-disc version the floppy is on the left, but indicator lights for both it and the Winchester are on the right, which can be confusing.

Although the main systems unit is relatively small, there is plenty of room inside. As well as holding the floppy and hard discs, it has space for extra RAM boards, a small and quiet fan, and the main motherboard, which seemed to be without last-minute patches and jumper wires. There are six expansion slots which will take standard Apricot cards.

The monitor sits freely on the main unit, and can tilt and swivel. Various models are available. For this review, we looked at Apricot's so-called paper-white model. Having experienced Northern Telecom's paper-white screen — see our August 1985 issue, page 66 — I beg to differ about the description. The Apricot version is pleasant but is nearer to an Apple Macintosh display — that is, slightly blue in tint. Scrolling and screen rewrites were accomplished quickly and smoothly, although there was a tendency for small undulations to float across the display.

KEYBOARD IMPROVED

The most interesting part of the hardware's appearance is the keyboard. Apricot has been dogged by an unfortunate track record regarding keyboards. Those on the PC family were acceptable but rather light, while the first models on the F series were almost unusable. The Xen's keyboard is easily Apricot's best, and a close competitor to the IBM PC's in terms of it suitability for professional applications. Its suspension is nicely judged, and the keys give at a definite point.

Other innovations include a back-lit LCD for the microscreen. I have always found the microscreen a useful auxiliary, especially for quick calculations. As programs like Sidekick gain currency, perhaps the need for it will diminish. The troublesome pressure-sensitive keys on the older Apricot PC have been replaced by proper keys. Extra keys include Alt, Pg Up, Pg Dn and, most usefully, Prt Scr for screen dumps. Clearly, Apricot has been listening to what its users have been telling it, a rare virtue which also shows in the mouse. Gone are the infrared fiddlings; instead you have a boring but sensible lead. As a result, the Xen was the first Apricot machine I have reviewed on which the mouse worked.

APRICOT XEN

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	■	☐
Documentation	☐	☐	☐	☐
Value for money	☐	☐	☐	■

☐ A superb machine, keenly priced, but possibly flawed by its lack of IBM compatibility.

Like Acorn's Communicator, reviewed on page 61 of this issue, the Xen is designed with communications very much in mind. Apricot has produced its own telephone unit, and a telephone-management system called Xen-Com will be available once approval for the hardware has been received. The telephone handset clips on to the side of the keyboard, preserving the lines of the Xen. There are also plans for a microphone to allow voice input to the computer itself.

Apricot has got a lot of the details of its design right. Running the machine proved it had got its sums right in this area too. As the Benchmarks show, in terms of processing power and disc accessing the Xen is a superb piece of engineering which can outrun most things on the market. For computationally intensive applications it looks to be a very good buy.

On powering-up the machine, you are greeted with Microsoft's Windows. Apricot is one of the first manufacturers to bundle this front end to MS-DOS. The version we saw was not totally stable, and it proved possible to crash the machine with some of

(continued on page 58)

BASIC BENCHMARKS

The figures below show the time in seconds taken to run the series of standard Benchmarks. The Xen emerges as the fastest 80286 machine we have tested, and hot on the heels of the Pinnacle, until now undisputed speed champ. However, the comparison is dubious since the Pinnacle runs under the p-System and does not use a standard compiled Basic.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Apricot Xen — 80286	0.3	1.1	2.4	2.5	2.7	4.9	7.7	8.0	3.7
TDI Pinnacle — 68000	0.3	0.4	0.8	1.2	1.3	3.2	4.1	11.8	2.9
Compaq Deskpro — 80286	0.3	1.2	2.8	2.9	3.2	5.7	9.1	9.2	4.3
IBM PC/AT — 80286	0.5	1.9	4.6	4.7	5.2	9.1	14.6	13.5	6.8

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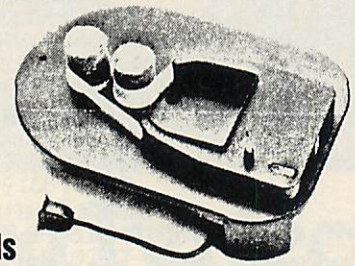

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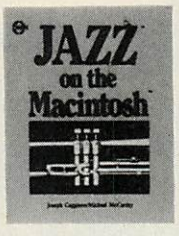

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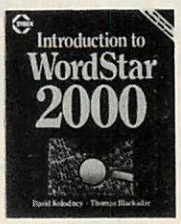

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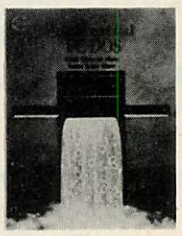

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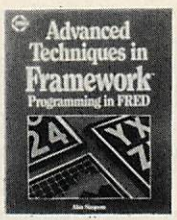

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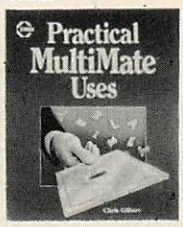

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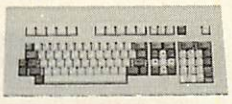

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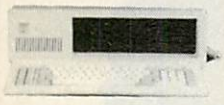

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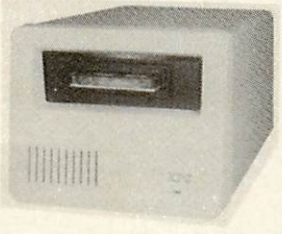

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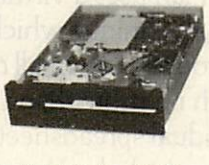

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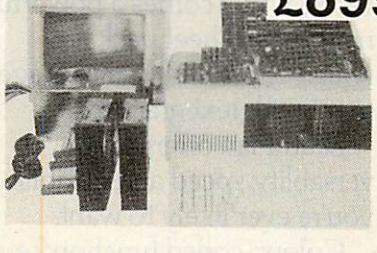

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BAGSHAW BENCHMARKS

	BM0	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	BM9	BM10	BM11	BM12	BM13	Total
Apricot Xen — 20Mbyte	0.4	1.8	2.2	2.9	3.5	5.3	0.5	5.5	0.6	1.5	2.7	15.7	10.0	6.3	58.8
Compaq Deskpro 286 — 30Mbyte	6.2	1.8	2.5	2.3	2.8	3.6	1.2	3.8	1.1	0.8	1.6	11	5.9	3.2	47.8
Apricot Xen — 720K	1.5	3.8	3.1	14.8	13.5	24.1	0.5	24.6	0.6	4.6	10.9	49.4	28.9	8.6	188.6
Compaq Deskpro 286 — 360K	10.5	4	4	12.5	15	16.4	5	17.5	5.3	8	13.4	75	45.5	18.2	250.3

The Bagshaw Disc Benchmarks confirm the Xen's superlative performance. For details of the routines see July 1985 issue, page 99.

(continued from previous page)

the commands. Apricot is confident that the versions shipped will have most of these problems cleared up.

In use, Windows is very fast. But working with the product for the first time and without manuals — Apricot was unable to supply them in time for review — I did not find it user-friendly. However, I preferred it to Digital Research's Gem.

Apricot is continuing to support Gem, but only on its low-end machines. It remains to be seen how the fracas with Apple, reported in last month's *Practical Computing*, will affect the overall appearance and working of the latter product. I would not be surprised if Gem is dropped and replaced by Windows throughout. The recent blessing given by IBM to the product — which is nominally in direct competition with its own Topview — seems likely to hasten its acceptance.

One bundled software package which was unfortunately unavailable for review was the IBM ROM BIOS emulator. This is one of Apricot's few concessions to what might seem to be an unavoidable fact of micro life: IBM compatibility.

The Apricot Xen does not run IBM software but it does offer two kinds of IBM compatibility. The first is data compatibility, which allows files to be swapped from an IBM machine to the Apricot. For example, when running Lotus 1-2-3 on both machines you can exchange data betwen them. But even this is problematic since the Apricot uses the superior but non-standard 3.5in. discs. To get round this, Apricot offers a 320K 5.25in. drive using the IBM disc format.

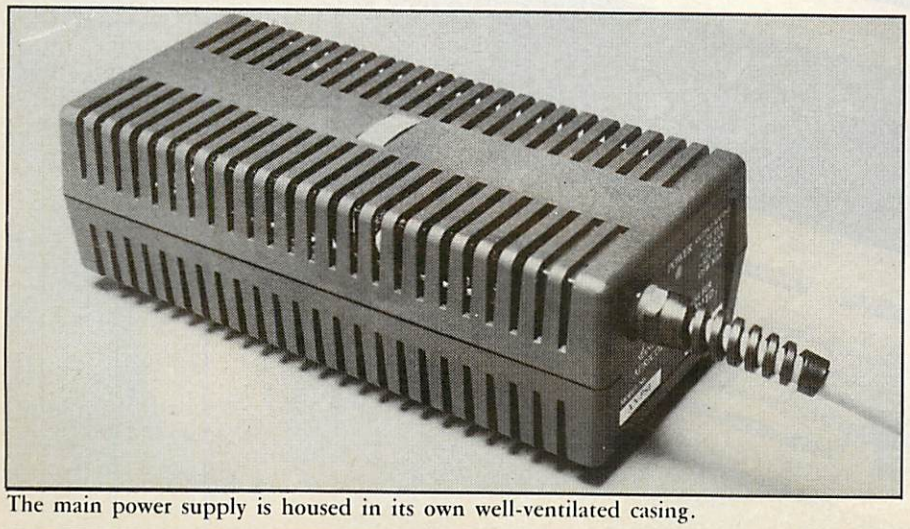
Another route towards IBMulation is via an add-on expansion box which provides two slots for either IBM PC or AT cards. It allows Xen users to tap the vast range of specialised boards available. In this respect Apricot is being very reasonable in not expecting add-on manufacturers to rush out and convert everything to the Xen formats.

Of course there is a price to pay for this limited IBM compatibility in so far as it introduces some incompatibility within the Apricot family itself. The IBM expansion board add-on unit has been accommodated by using a technique known as port-mapping. The Xen addresses certain functions, such as initial boot routines and the handling of serial and parallel data transer, in a different way to earlier machines. Screen and microscreen handling are unchanged.

NOT QUITE COMPATIBLE

The Apricot programs likely to be affected by such changes are comms packages which will be disappointed when they look in particular locations for specific functions. On the IBM front, this port mapping will fail with those programs, like Lotus 1-2-3, which check the hardware.

Apricot has not called its 80286 machine Xen for nothing: the company has announced its intention of releasing Xenix for it in 1986. But the question arises as to just how serious the company is about this particular flavour of Unix. For a long time Unix has been touted as the micro operating system of the future. It is particularly well suited to multi-user operation, and the entrance of IBM into the micro Unix market in a big way could give it the kick it needs. Also it might enable the Xen to pick up IBM compatibility without really trying, solving many of its problems at a stroke. Perhaps Apricot knows something we don't.



The main power supply is housed in its own well-ventilated casing.

It is paradoxical that a company which has been so prodigal with its products needed a new one as badly as Apricot needed the Xen. At the bottom end of the market it offers the F series and the ugly duckling of the family, the Portable. Then there are the popular PC products which have been the mainstay of the series. Finally there is a host of file servers and local area network products. However, with the introduction of the IBM PC/AT in 1984, the Apricot family has been left looking long in the tooth.

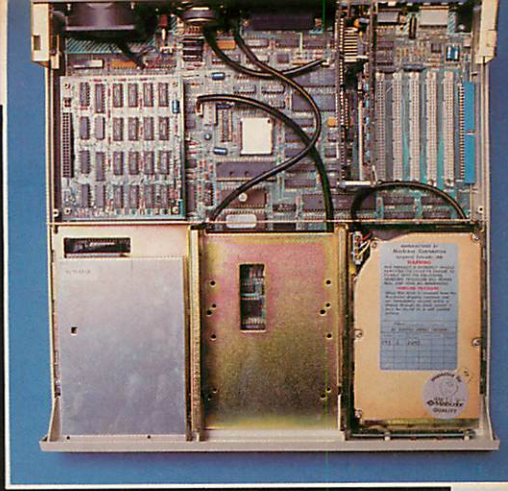
Apricot claims that the new machine offers the performance of the PC/AT for the price of the PC/XT and regards it as a competitor for the latter. However, the hard-disc version of the Apricot PC, the XI, meets the challenge and has proved very popular with business users. So it is curious that the company should slant its new machine down-market from its obvious niche and in apparent competition with one of its own products.

The biggest worry is that by sticking with MS-DOS Apricot is going to get left behind. It is in an impossible position, since Apricot must strive to retain compatibility within the Apricot family and its many loyal users, yet it wants to move more in the direction of the IBM PC.

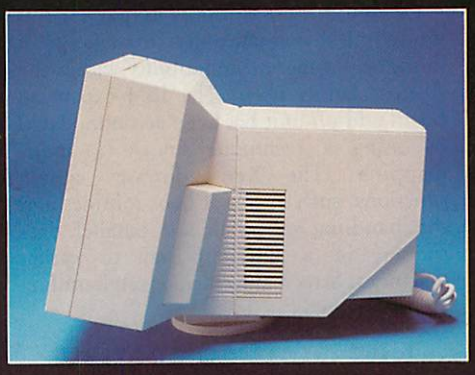
Perhaps IBM will announce its full backing for Xenix and perhaps too there is enough slack in the U.K. corporate micro market to take up the Xen. But the danger is that the policy of buying IBM-only will have spread too far. I hope not: the Xen is a beautiful machine, and deserves to succeed. Whether it does or not remains to be seen.

CONCLUSIONS

- The Xen is a very fast 80286 machine running under MS-DOS. Microsoft's Windows is bundled with the machine as a user-friendly front end.
- Surprisingly, only limited IBM compatibility is offered. It remains to be seen whether this is a fatal flaw.
- The price is very competitive for the hardware offered. All parts of the unit are finished to a high standard.
- Apricot has regressed to a separate power unit which stands on the floor. This may be inconvenient but it does mean that the main systems box is exceptionally light and slim.
- At last Apricot has provided a keyboard worthy of its machines. It includes a microscreen, and a mouse option.
- The telephone-manager system, not available for review, is potentially a big plus for the machine and could be a key element during the next year.
- The possibility of running the multi-user Xenix operating system might turn out to provide it with the IBM compatibility it now lacks. PC



The Xen is an exceptionally light and slim machine, engineered and finished to high standards.



SPECIFICATION

CPU: 80286 running at 7.5MHz
RAM: 512K expandable to 1Mbyte
ROM: 64K bootstrap and diagnostics
Dimensions: main unit 380mm. (15in.) x 370mm. (14.5in.) x 105mm. (4.2in.); keyboard 195mm. (7.7 in.) x 465mm. (18.3in.) × 55mm. (2.2in.)
Weight: main unit 6kg. (13.2lb.); keyboard 1.75kg. (3.8lb.); power-supply unit 3kg. (6.6lb.)
Display: 80 columns by 25 lines, 800 by 400 pixels maximum resolution on white monitor; 640 by 350 pixels and 16 colours on high-resolution monitor; 640 by 200 pixels and four colours on standard monitor; two-line 40-character back-lit LCD
Keyboard: full QWERTY, 10 function keys, further six microscreen keys, numeric keypad, separate cursor pad
Mass storage: two 720K 3in. floppies on entry-level machine; upgrades include one floppy and 20Mbyte Winchester
Interfaces: RS-232 and Centronics ports; mouse, phone set and microphone ports
Software in price: MS-DOS 3.1, GWBasic, IBM ROM BIOS emulator, asynchronous communications
Software options: Xen-Com communications package
Hardware options: IBM expansion-card unit, 5.25in. 320K floppy drive, 80287 co-processor, mouse
Price: entry-level system £2,490 with one floppy, 512K RAM, keyboard and green monitor; 20Mbyte Winchester version with 1Mbyte RAM, keyboard and white screen £4,885; IBM expansion card box £195; 5.25in. floppy £295; Xen-Com package including telephone £395
Manufacturer and distributor: Apricot Computers plc, Apricot House, 17 Westbourne Road, Edgbaston, Birmingham B15 3TR. Telephone; 021-454 9091
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REVIEW

APRICOT XEN
NOT AN AT-EMULATOR

By Glyn Moody

The U.K.'s leading business micro manufacturer goes it alone again with this fast, well-engineered and keenly priced 80286 machine.

The Xen is Apricot's long-awaited top-of-the range model, based around the 80286 chip used by the growing ranks of IBM AT-alikes. Apart from its excellent engineering, top-flight performance and competitive price, the most interesting things about the Xen are that it is not aimed at the PC/AT but the PC/XT, and that it is not IBM compatible.

The entry-level system comes with 512K RAM, two 3.5in. 720K floppies, serial and parallel ports, keyboard, green screen, MS-DOS 3.1 and Windows, and costs £2,490. The £4,885 20Mbyte Winchester version with 1Mbyte RAM and white screen is reviewed here. Upgrade options include up to 5Mbyte of RAM, a tape streamer and an 80287 maths co-processor. In addition to MS-DOS, Xenix should be available in early 1986.

The appearance of the Xen is characteristically neat. Traditionally, Apricot has turned in tightly designed packages which often take up far less space than their competitors. Unfortunately, this time it has cheated. The very light and slim unit is possible because there is a separate power unit, which sits on the floor. In principle there is nothing wrong with this approach; but one drawback is that the power unit has numerous ventilation slots which are crying out to have coffee spilt into them.

The design of the systems unit is similar to those in the F series with a stepped top. On the hard-disc version the floppy is on the left, but indicator lights for both it and the Winchester are on the right, which can be confusing.

Although the main systems unit is relatively small, there is plenty of room inside. As well as holding the floppy and hard discs, it has space for extra RAM boards, a small and quiet fan, and the main motherboard, which seemed to be without last-minute patches and jumper wires. There are six expansion slots which will take standard Apricot cards.

The monitor sits freely on the main unit, and can tilt and swivel. Various models are available. For this review, we looked at Apricot's so-called paper-white model. Having experienced Northern Telecom's paper-white screen — see our August 1985 issue, page 66 — I beg to differ about the description. The Apricot version is pleasant but is nearer to an Apple Macintosh display — that is, slightly blue in tint. Scrolling and screen rewrites were accomplished quickly and smoothly, although there was a tendency for small undulations to float across the display.

KEYBOARD IMPROVED

The most interesting part of the hardware's appearance is the keyboard. Apricot has been dogged by an unfortunate track record regarding keyboards. Those on the PC family were acceptable but rather light, while the first models on the F series were almost unusable. The Xen's keyboard is easily Apricot's best, and a close competitor to the IBM PC's in terms of it suitability for professional applications. Its suspension is nicely judged, and the keys give at a definite point.

Other innovations include a back-lit LCD for the microscreen. I have always found the microscreen a useful auxiliary, especially for quick calculations. As programs like Sidekick gain currency, perhaps the need for it will diminish. The troublesome pressure-sensitive keys on the older Apricot PC have been replaced by proper keys. Extra keys include Alt, Pg Up, Pg Dn and, most usefully, Prt Scr for screen dumps. Clearly, Apricot has been listening to what its users have been telling it, a rare virtue which also shows in the mouse. Gone are the infrared fiddlings; instead you have a boring but sensible lead. As a result, the Xen was the first Apricot machine I have reviewed on which the mouse worked.

APRICOT XEN

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	■	☐
Documentation	☐	☐	☐	☐
Value for money	☐	☐	☐	■

☐ A superb machine, keenly priced, but possibly flawed by its lack of IBM compatibility.

Like Acorn's Communicator, reviewed on page 61 of this issue, the Xen is designed with communications very much in mind. Apricot has produced its own telephone unit, and a telephone-management system called Xen-Com will be available once approval for the hardware has been received. The telephone handset clips on to the side of the keyboard, preserving the lines of the Xen. There are also plans for a microphone to allow voice input to the computer itself.

Apricot has got a lot of the details of its design right. Running the machine proved it had got its sums right in this area too. As the Benchmarks show, in terms of processing power and disc accessing the Xen is a superb piece of engineering which can outrun most things on the market. For computationally intensive applications it looks to be a very good buy.

On powering-up the machine, you are greeted with Microsoft's Windows. Apricot is one of the first manufacturers to bundle this front end to MS-DOS. The version we saw was not totally stable, and it proved possible to crash the machine with some of

(continued on page 58)

BASIC BENCHMARKS

The figures below show the time in seconds taken to run the series of standard Benchmarks. The Xen emerges as the fastest 80286 machine we have tested, and hot on the heels of the Pinnacle, until now undisputed speed champ. However, the comparison is dubious since the Pinnacle runs under the p-System and does not use a standard compiled Basic.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Apricot Xen — 80286	0.3	1.1	2.4	2.5	2.7	4.9	7.7	8.0	3.7
TDI Pinnacle — 68000	0.3	0.4	0.8	1.2	1.3	3.2	4.1	11.8	2.9
Compaq Deskpro — 80286	0.3	1.2	2.8	2.9	3.2	5.7	9.1	9.2	4.3
IBM PC/AT — 80286	0.5	1.9	4.6	4.7	5.2	9.1	14.6	13.5	6.8

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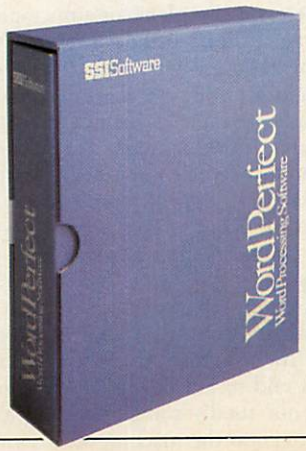

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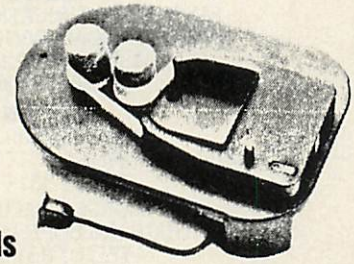

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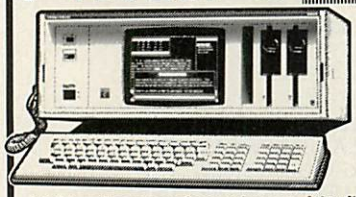

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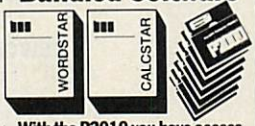

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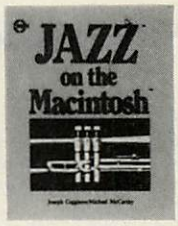

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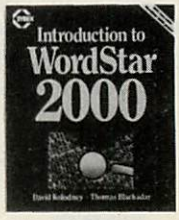

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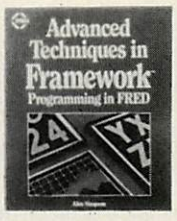

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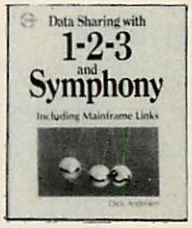

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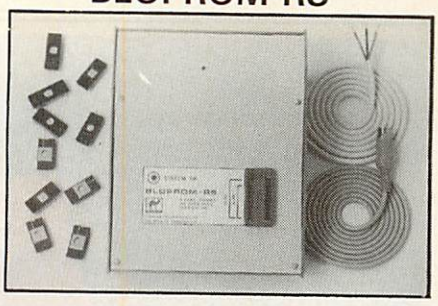

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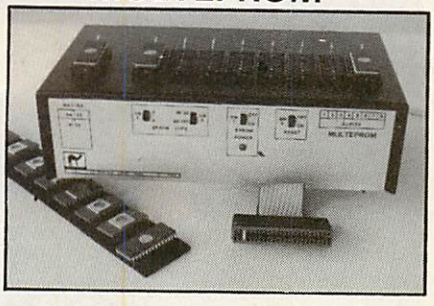

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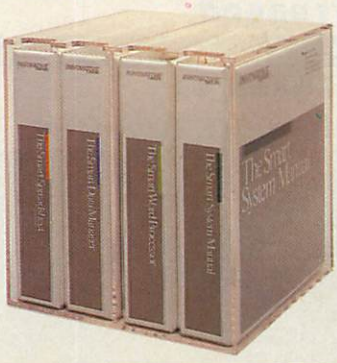

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TOP 10

As more people use micros on the move, lap portables are becoming more popular. David Barlow introduces our Top 10 selection.

ILLUSTRATION: GARY WING

Since the last battery portable round-up the market seems to have got its priorities mixed up. Although sophistication has continued to grow at the top end of the range, development in the cheaper, less powerful machines has tended to stagnate somewhat. This is a strange phenomenon as a portable at the top end of the market is becoming an increasingly expensive proposition, especially when compared to a desk-top machine of similar potential. However, at the lower end things are beginnings to improve, at least as far as sales are concerned. More and more people are beginning to realise the full potential of the really small machines, especially for applications which involve the collection of data while in the field.

However, there is one problem that is universal across the range: the LCD display. Although the enthusiasm to pack as much power into as small a box as possible tends to be a natural aim of the computer industry, so far the major manufacturers have failed to produce a viable alternative to this much criticised display medium. Almost without exception this device fails to produce a display which can be read easily without the need for constant adjustment to the viewing angle and nature and location of light source. The big advantage of an LCD is its lower power consumption and size.

ALTERNATIVE DISPLAYS

Although there are now alternative systems which are shallow enough to be used in portables they have so far failed to make the grade. The most successful of these is the plasma display found in the Ericsson PC. This produces a pleasant, if rather dim, amber display but uses power very inefficiently, drawing far too large a current to permit the use of rechargeable cells. There is hope on the horizon in the form of back-lit LCD displays that will shortly appear officially in the U.K. on machines including the Zenith Z-171 and Sharp PC-7000.

The cheaper and lighter portables still rely on CMOS memory to store both program and user data. The data is protected when the machine is switched off by the use of auxiliary rechargeable batteries which can retain the contents for a minimum of one week. If the user wishes to back up data more permanently he or she will have to load it on to a conventional cassette recorder. So far bubble memory has proved too expensive to be taken up by manufacturers in any great amount. The smallest and lightest computers in this group exhibit few concessions to ergonomics with non-adjustable screens and cramped calculator-like keyboards.

If file security is important then you may need to go up to the next group, which usually boast some form of on-board storage ranging from the Epson PX-8's micro-cassette system to the Bondwell's 3.5in. floppy disc. This type of sysem also makes it easier for software other than that bundled with the machine to be loaded. The snag is that as soon as a disc drive is added, the power consumption of the machine increases dramatically, necessitating both bigger and heavier batteries. This is illustrated by the Bondwell, which is around three times heavier than the Epson PX-8.

Things are really looking up in the top range of portables. There is now a selection of machines carrying on the theme set by the Data General One of offering full-blown desk-top PC power while on the move. The trouble is that the CMOS technology used is very expensive and the new machines are arriving on the market at a time when the price of their desk-top equivalents is falling through the floor. For instance, the Toshiba 1100 costs £2,000 for a single disc drive machine excluding any software. A desk-top PC compatible bundled with loads of software can now be purchased for half that amount.

ALMOST COMPATIBLE

What makes these sophisticated portables attractive is that they claim to be IBM compatible. In its strictest sense IBM compatibility means that users can run any application package intended for the IBM in off-the-shelf form. At the moment such software is only available on the conventional 5.25in. 360K discs. Unfortunately, largely due to space considerations the majority of machines in this group use the 3.5in. Sony drive, although a notable exception is the competitively priced Datavue 25.

If users wish to run additional IBM software to that supplied with the machine they will have two options open to them. The first is to check whether the machine manufacturer has a special version of the package available for use on 3.5in. drives. The second option is to purchase the external 5.25in. disc and transfer the software over from that on to a 3.5in. disc. Unfortunately this system is expensive and may well fall foul of the copy-protection systems found on software these days which needs to check the validity of the master disc prior to allowing a copy to load. In the long term it seems likely that IBM will go over to using 3.5in. drives on its new machines. It already uses them on some machines destined for the Far East. If this happens then the software houses will be forced into offering all their packages on the 3.5in. disc. However, there can be no guarantee that IBM will use a format 100 percent compatible with its 5.25in. discs.

One final point to watch when comparing portables of any size is to beware of false promises concerning integral modems. Check that the one you are buying has BT approval and not just a place in the long queue waiting to receive the accolade. PC

SUPPLIERS

Bondwell Barbatan Ltd, 35-38 High Street, Bristol BS1 2AW. Telephone: (0272) 213928. Circle no. 361.
Datavue Interquadram Ltd, 653 Ajax Avenue, Slough, Berkshire SL1 4BG. Telephone: (0753) 34421. Circle no. 362.
Data General Data General, Hounslow House, 724-734 London Road, Hounslow, Middlesex TW3 1PD. Telephone: 01-572 7455. Circle no. 363.
Epson Epson (U.K.) Ltd, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892. Circle no. 364.
Husky Husky Computers Ltd, PO Box 135, 345 Foleshill Road, Coventry CV6 5RW. Telephone: (0203) 668181. Circle no. 365.
Kaypro Kaypro (U.K.) Ltd. Telephone: (06286) 67547. Circle no. 366.
NEC NEC Business Systems (Europe) Ltd, 35 Oval Road, London NW1 7EA. Telephone: 01-267 7000. Circle no. 367.
Olivetti British Olivetti Ltd, PO Box 89, 86-88 Upper Richmond Road, London SW15 2UR. Telephone: 01-785 6666. Circle no. 368.
Sharp Sharp Electronics (U.K.) Ltd, Sharp House, Thorp Road, Manchester M10 9BE. Telephone: 061-205 2333. Circle no. 369.
Tandy Tandy Corporation, Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA. Telephone: (0922) 648181. Circle no. 370.
Toshiba Toshiba (U.K.) Ltd, Toshiba House, Frimley Road, Frimley, Camberley, Surrey GU16 5JJ. Telephone: (0276) 62222. Circle no. 371

BONDWELL 2 — £995

This compact portable is manufactured in the Far East and distributed in the U.K. by Bristol-based Barbatan. Based on the eight-bit Z-80 processor, this machine is not in the same league as the 8088-based machines as far as performance is concerned. But this is often a minor consideration in a portable. Supplied with 64K RAM and a single 360K 3.5in. disc drive, the Bondwell 2 is still an excellent compromise. The 80- by 25-character LCD is smaller than average so the text produced is rather small and tiring to read. Display contrast is average for its class. The machine's major attraction is the bundled software which includes WordStar, Mailmerge, Calcstar, Datastar, Reportstar and Scheduler.

FOR Compact. Integral disc drive. Bundled software.

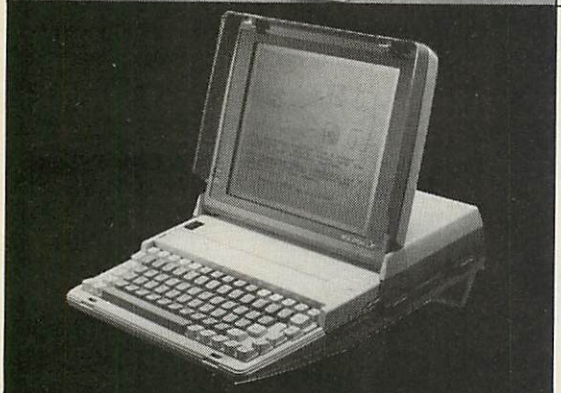
AGAINST Small LCD.

DATAVUE 25 — £1,695

Imported from the U.S. by Interquadram, the Datavue 25 offers full IBM PC compatibility by virtue of its single 5.25in. disc drive, at a competitive price. It is bulkier than some of the latest portables of this type and weighs around 6kg. Based on the Intel 80C88 the machine boasts a full complement of 640K RAM and useful RAM disc software all included in the basic price. Both serial and parallel ports are fitted as standard along with a clock calendar and mains adaptor. The 80- by 25-character LCD offers graphics resolution of 640 by 200 pixels or 320 by 200 pixels with four shades of grey. The battery pack is listed as an option along with a second 5.25in. drive. With the exception of MS-DOS no software is included in the basic price.

FOR IBM compatible. Large standard memory. Good value.

AGAINST Rather bulky. Not an established make.



DATA GENERAL ONE — £2,577

This was the first LCD-screen IBM compatible to appear and is still regarded as the Rolls-Royce of portables. It is expensive but fully equipped with Intel 80C88 processor, clock calendar, 512K RAM, and single or dual 3.5in. 720K floppy discs. The 80- by 25-character 10in. LCD screen is much larger than most of the competition but still requires careful positioning to obtain optimum legibility. The keyboard is rather cramped but manages to include nearly all keys found on the IBM PC. There are two serial ports but no parallel ports. Options include an external 5.25in. drive to allow IBM software to be loaded and an external IBM expansion bus. This provides five vacant slots, an RGB monitor interface and a 5.25in. drive.

FOR Powerful. Well equipped.

AGAINST Expensive. LCD display.

EPSON PX-8 — £917

This CP/M-based eight-bit machine, although rather long in the tooth, still represents one of the best all-round compromises for computing on the move at a reasonable price. The Z-80 processor is coupled to 64K RAM as standard but this can be expanded to 128K by the addition of memory modules which are fitted to the base of the machine. Software is supplied as plug-in ROM but a microcassette is provided to load third-party software and store data. The LCD screen displays 80 characters across but only eight lines down. Optional items include an external battery-powered 3.5in. disc drive, printer and acoustic-coupler modem. ROM-based software bundled with the PX-8 includes WordStar, Portable Calc, Portable Card Box Plus, Portable Scheduler and Basic.

FOR Portability. Bundled ROM-based software.

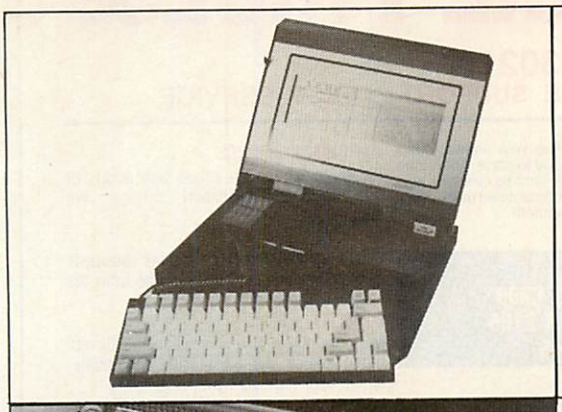
AGAINST Eight-line display.

HUSKY HUNTER — £1,147

Coventry-based Husky produces a remarkably comprehensive range of portables for use in industrial environments. The Hunter is the most conventional of its range. It is CP/M compatible and can handle up to 352K of memory, which makes it especially useful for collection of large amounts of field data. The display is small at 40 characters by eight lines and cannot be angled in any way to improve legibility. However, ruggedness is the key as the Hunter is enclosed in heavy-duty metal case and the keyboard is sealed. There is a vast range of useful peripherals and special models available for hazardous areas and military use. The Hunter is bundled with a Basic interpreter, text editor and comms software.

FOR Rugged. Large memory. Well supported.

AGAINST Expensive. Small keyboard.

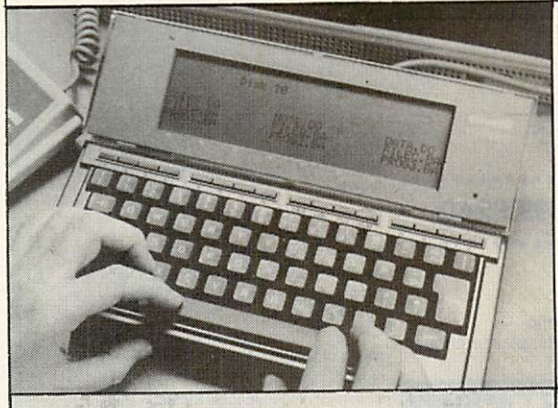


KAYPRO 2000 — £1,711

This new machine is supplied in a tough metal case and weighs in at 5kg. Based on the Intel 80C88 chip the Kaypro 2000 is supplied as standard with 256K RAM, a removable keyboard and 80- by 25-character LCD. This suffers from the usual drawbacks but Kaypro is promising an expansion box which allows the machine to drive a conventional monitor when in the office. On-board storage is provided by a single 3.5in. 720K drive which pops up when the machine is unfolded. The use of this type of drive as opposed to the usual 5.25in. unit makes it hard to confirm Kaypro's claims of IBM compatibility. But this may not be critical as the 2000 is bundled with software including WordStar, Mailmerge, Infostar, Calcstar, Mite, Polywindows, and Travelling Expense Manager.

FOR Fast. Powerful. Partially IBM compatible. Bundled software.

AGAINST LCD display. Expensive if you do not need the software.



OLIVETTI M-10 — £399

The Olivetti M-10 is one of the first generation of Kyocera portables. Kyocera supplies similar machines to other manufacturers' slightly different specifications: the Tandy 100 and NEC PC-8201a. As with the Tandy 200 no permanent form of storage is provided, and memory is at a premium on the Olivetti, which has only 8K of RAM. The LCD screen can only display eight lines by 40 characters, but legibility is excellent. The three manufacturers' machines have slightly different strong and weak points. The NEC version is the most powerful and has the greatest expansion potential. There are variations in the bundled software, but all include some useful programs; a considerable amount of third-party software is also available on ROM chips or tape.

FOR Cheap. Pleasant to use. Bundled software. Well established.

AGAINST Limited expansion. Small display.

SHARP PC-1500, PC-1350 — £190/£130

The smallest of all portables, these units are described by their manufacturer as pocket computers. To most of us they look like over-inflated calculators but still boast up to 19K of RAM, 40K of ROM, a mini QWERTY keyboard and an LCD. In the case of the PC-1500A this is just one line of 26 characters, but the PC-1350 can handle up to four lines of 24 characters. Both machines can be enhanced by the addition of peripherals, including RAM/ROM modules, cassette-tape recorders, printers and plotters. Software supplied as standard is limited to a simple Basic interpreter but there are a wealth of custom packages available from third-party software houses.

FOR Pocket size. Useful selection of peripherals and software.

AGAINST Limited display facilities. Calculator keyboard.

TANDY 200 — £799

The 200 is part of the second generation of portable computers to come out of the Kyocera company. Similar in design to the Tandy 100 and its sister products, it is distinguished by the larger LCD screen able to display 16 lines of 40-column text. There is no integral means of storing programs and so data users will have to leave them in RAM or use an external cassette recorder. The 200 does offer better memory facilities than its smaller sibling, coming as standard with 74K ROM and 24K RAM, expandable to 74K. The bundled ROM-based software includes the respected Microsoft Multiplan, and simple word processor, comms, address book and scheduler packages.

FOR Large display. Good memory expansion. Multiplan software.

AGAINST Pricey. No on-board permanent storage.

TOSHIBA T-1100 — £1,950

Another new entrant, this time from Japan, the T-1100 is a clever, well-engineered design supplied in a plastic case, which although not as robust as metal keeps the total weight down around 4kg. Intended to be stored in the briefcase while travelling, the T-1100 is based on the Intel 80C88 chip and is supplied with 256K RAM. The 80- by 25-character LCD offers above average legibility but an RGB monitor interface is fitted as standard just in case. Disc storage takes the form of a 720K 3.5in. drive but external 3.5in. and 5.25in. drives are to be found on the option list. IBM compatibility is claimed but within the limitations of the 3.5in. drive. No software is provided, making the T-1100 very expensive.

FOR Well made. Partially IBM compatible. RGB interface as standard.

AGAINST Very expensive.

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INTERVIEW

CHUCK PEDDLE

President of Tandon Computer Corporation

INTERVIEWED BY GLYN MOODY

Chuck Peddle obtained a degree in engineering in 1959, and then joined General Electric working on various computer projects. In 1970 he left to form his own company making intelligent terminals and in 1972 formed a word-processing company. He then joined Motorola and was part of the design team for the 6800 microprocessor family. In 1974 Peddle left Motorola and joined MOS technology where he was chief architect of the 6502 and its siblings. After Commodore bought MOS Technology, Peddle developed the Pet, the first personal computer. Later Peddle founded Sirius Systems Technology and designed the Victor 9000/Sirius 1, the first 16-bit business computer. Since leaving Sirius, Peddle has been involved with Tandon Computer Corporation, a division of the disc-drive manufacturer Tandon Corporation, in its launch of low-cost PC clones — see page 15 for details.

What exactly were the circumstances surrounding your departure from Sirius?
WHEN the company got into some financial trouble the Chief Executive Officer asked me to stay on to help them develop some products which we hoped to sell to a large OEM customer. And when the company had to go to Chapter 11 the bank basically asked me and the technical team to leave.

How did the tie up with Tandon come about?
JUGI TANDON, the President of Tandon Corporation, and I knew each other well. I first met Jugi in 1978 when Steve Jobs and I flew down to ask him about whether he was going to go into the disc-drive business. So when Sirius went into Chapter 11 we spent quite a bit of time talking with Jugi about how he was going to penetrate the PC market — how he could use his disc technology to maximise his penetration into the end-user market.

What is your role in the company?
WITH TCC I'm President. I'm also President of a holding company of a management-consultant company that I'm a consultant in. And currently I am on staff assignment to Tandon, helping Jugi run his computer business.

Is this a staff assignment from the consultancy company or TCC?
YES; both. If you look at our relationship with Tandon at the management level, Jugi is on our board of TCC, Tandon's our major investor. So it's a very close relationship. Jugi and myself are basically betting that over the next two years we can make Tandon a very successful end-user product.

To what extent did you shape the particular products that have just been launched?
BASICALLY we just worked out the marketing strategy for Tandon going into this, because most of the work had already been done. Our team is working for Tandon on future products. The concept of how do you bring an AT to the market, what configuration and so forth, is ours.

What sort of things have you learnt from your progressive careers?
OUR experience over the past couple of years has shown us how to make use of the IBM standard to our advantage rather than fight it. Olivetti made a tremendous turnaround by dropping the Z-8000 machine, which was terribly non-standard, and coming over to the PC. I think that message is there.

Looking towards the future do you think that the IBM standard along with Intel is the only way to go?
IF you look at the software base, the most successful machine you could come up with now is one which ran both Apple II and PC programs and cost $50 more than the Apple II. It's the best product you could come up with. It would have a hard disc for that price. Given that's not coming off for at least six months, I think you're in a situation where the Apple II programs are running out of steam. I don't think the Jackintosh or Amiga products will ever develop the software base. So I think that your software base is almost exclusively devoted to PC XT/AT base.

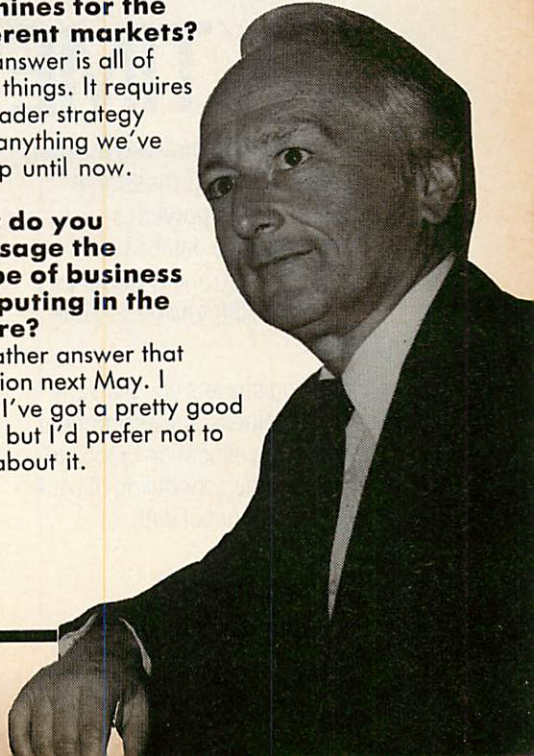
So do you think the Mac is doomed?
NO. I don't think it's doomed, but I don't think it's destined to be a big player unless it develops the ability to run the full software base.

You used to be very keen on LANs, are you still?
WE absolutely believe that. The problem is IBM's just frozen the market for another year, by announcing the Token Ring but promising not to ship it for another year. But we think there's going to be some other things coming in. I think we'll see the market take a deviation next year from just the LAN.

Such as?
WELL, we're still trying to come up with configurations which fall as a machine in the office and machines in the home.

Will that be one machine which services both markets or two machines for the different markets?
THE answer is all of those things. It requires a broader strategy than anything we've got up until now.

How do you envisage the shape of business computing in the future?
I'D rather answer that question next May. I think I've got a pretty good idea, but I'd prefer not to talk about it.



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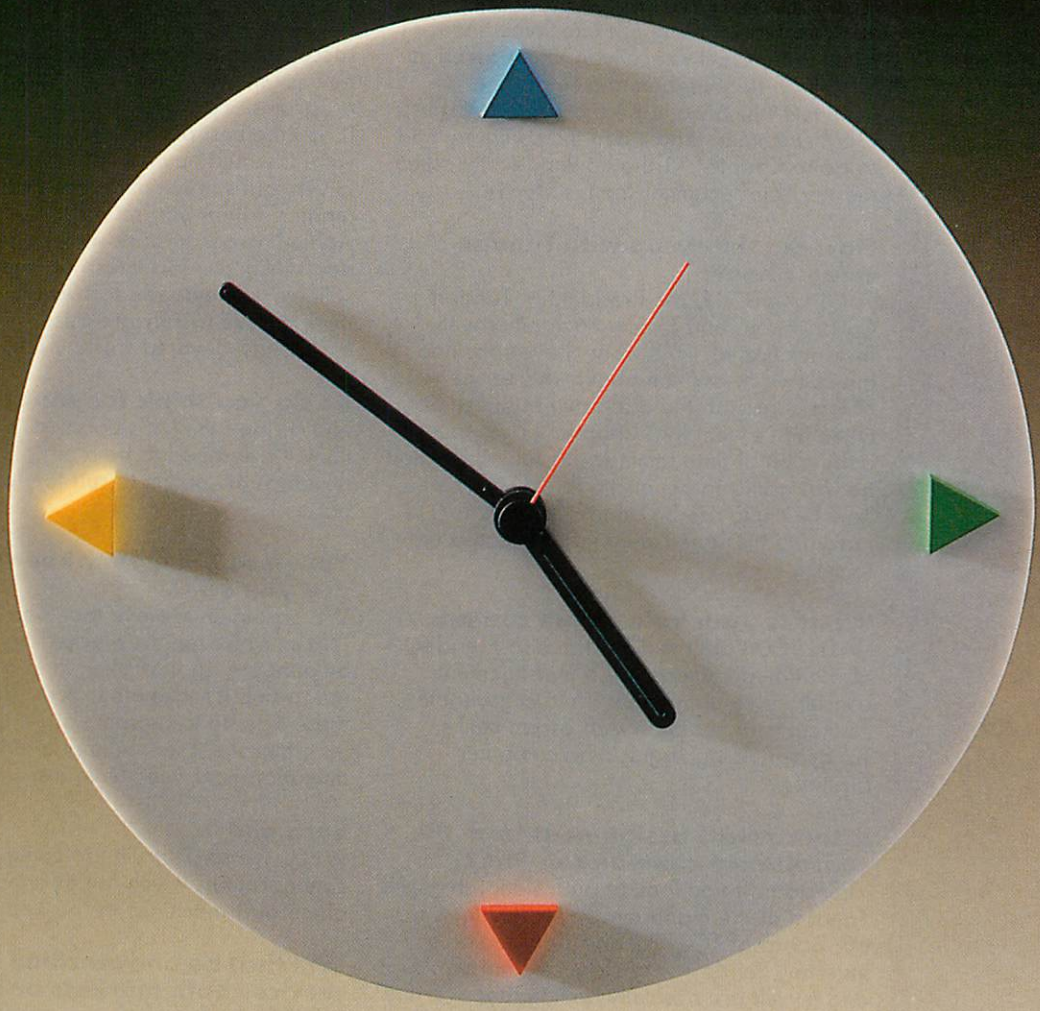

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(continued from page 91)

disc space on a micro are limited, and large all-in-one packages can end up cripplingly slow.

For these reasons, the tendency now is only to integrate three or four functions together. Where these are grouped around a central task such as spreadsheet analysis or data handling we have dealt with the package under the relevant heading. In fact, most modern business packages are integrated to some extent, and when not taken to extremes this can add to the usefulness of the package without over-filling the disc or slowing things down unduly.

INTEGRATED 7

Seven-in-one low-cost package from the same stable as Twin. Functions are database, mailing , spreadsheet, WP, presentation graphics, communications and terminal emulation. The database and graphics look particularly interesting on paper, though this is a new product which we have not yet seen. Not copy protected.

IBM	£595	Future Management

JAZZ

Excellent spreadsheet, plus WP, graphics database, and comms; word processor can incorporate graphs and data. Lotus has done a good job on making it easy to use, but has had to cut the help feature which makes 1-2-3 so good. Reviewed September 1985.

Mac	£495	Lotus

OPEN ACCESS

Six-in-one: excellent database, nice graphics, big spreadsheet, WP, comms and time management. All six are up to scratch, and are good for handling lots of data. Suitable for the more experienced user rather than beginners. Multi-user network version imminent. Reviewed September 1984.

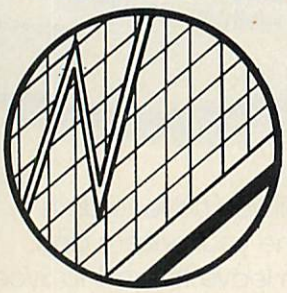
IBM, MS-DOS	£450	SPI

SYMPHONY

Spreadsheet, database, graphics, WP and comms. Ace spreadsheet, but the package is memory hungry. Many users prefer Lotus's less ambitious 1-2-3. Reviewed February 1985. Copy protected.

IBM	£595	Lotus

5 GRAPHICS



IN THE LAST year or so graphics software has improved a great deal. At the same time, a distinction has grown up between analytic and presentation graphcs are handled. Analytic graphics are those functions that help with the understanding of data, and it obviously make sense to have these charting and graphing facilities integrated inside the spreadsheet or database where you do most work on your data.

AUTOCAD

Full-feature technical-drawing package. Aimed at engineers and architects, Autocad is a true drafting and design program, not a business presentation tool. It lets you build up shapes from geometric primitives and draw two-dimensional objects with accurate dimensioning. Three-dimensional objects are represented with wire-frame models. Very powerful but specialised. Not copy protected.

IBM	£1,000-£2,500	Xitan, KGB

DOODLE

Expensive but popular drawing package which lets you mix drawings in among WP documents. Works with WordStar, Multimate and other word processors or as stand-alone drawing package. Supports wide range of printers, plotters and graphic input devices.

IBM, MS-DOS	£795	Trilex

GRAPHWRITER

Extremely comprehensive presentation-graphics package. Offers fairly specialised formats like Gantt charts and bubble charts, and supports a wide range of output devices. Expensive, but very flexible. Copy protected.

IBM	£508	Softsel

VCN EXECUVISION

Presentation-graphics package for charts, words and pictures. Lets you create the usual kinds of chart and then enhance them with pictures from a built-in image library; you don't have to be able to draw. Additional image libraries are also available. Copy protected.

IBM	£343	P&P, IBM

COMMS 6

AS OUR feature in the December issue reported, comms is currently a very active area in the business micro field. The growth in the installed user base of business micros — is now being matched by a desire to switch information between them. Comms packages fall into two main classes: file-transfer and full-blown communications software. Inevitably there is some overlap between the two.

APPLE TURNOVER

Unusual file-transfer program. Makes one of your IBM PC disc drives think it is an Apple drive. This gives you a very convenient way of reading Apple II series files into your IBM, but the process does not work the other way, from IBM to Apple.

IBM	£280	P&P

ASCOM

Flexible comms program. Good for email and terminal emulation; has good help facilities. Particularly suitable for uses with non-standard autodial modems because you can customise settings.

IBM, MS-DOS, CP/M	£170	Telesystems

BSTAM

File-transfer and comms program. Lets you transfer files between machines ot same or different type, either directly or through modem. Flexible but not as easy as some other programs. The Apple version assumes you have Z-80 card and Apple CP/M.

IBM, Apple	£150	P&P

CHIT-CHAT

Comms program. Comes already set up for the most popular U.K. electronic mail and bulletin board services. Also available with autodial modem for an extra £269. Reviewed December 1985.

IBM, MS-DOS	£130	Sagesoft

CROSSTALK

Comms program. Lets you get programs and data to and from other computer systems, either down a cable or through the telephone system via a modem. Very flexible.

IBM, MS-DOS, Apple II, CP/M-80	£169	P&P Softsel, First

MISSING LINK

Comms program, supplied complete with modem card. Supports viewdata services as well as ASCII systems such as Telecom Gold. Like Chit-Chat, the advantage is that purchase is a simple one-off affair.

IBM	£499	PC Communications

PC TO MAC AND BACK

File-transfer program. Lets you move data between the IBM PC and the Mac both ways. Comes complete with cable and very complete documentation.

IBM, Mac	£138	P&P, Softsel

SMARTCOM

Comms package from major modem supplier. Works with most modems, but when used on conjunction with Hayes Smartmodem 1200 the package lets you switch easily between voice conversations and data transmission or autodialling.

IBM	£140	Hayes

TX

Lets you transfer data from one type of computer to another. You buy kit for two specific machines, consisting of two discs, manual and correct cable. Works with modems for remote comms.

IBM, MS-DOS, CP/M	£165	Wordmongers

VICOM

Exceptionally easy-to-use comms package. Supports viewdata services as well as ASCII text services such as Telecom Gold. Uses colour on Apple II and different typestyles and shades on the Mac. Reviewed December 1985. Copy protected by key-disc method.

Mac, Apple II	£150	P&P, Softsel, First, Apple

7 UTILITIES

ANYONE making much use of a computer is eventually bound to get interested in utilities. The utilities that sell well nowadays are not the obscure and difficult programming tools that used to be popular. Rather they are simple, well-packaged programs which let you do something more quickly, more conveniently or a little differently to the way standard software allows.

COLOR SHOP

Print utility, designed for use with colour printers. Color Shop sits in memory at the same time as another software package such as Lotus 1-2-3 or Microsoft Chart and intercepts output to the printer, letting you assign colours to different parts of the image.

IBM	£79	First

COPY II

Bit copier. Lets you make backup copies of most copy-protected business software. Mac version includes many standard housekeeping functions that would be found in a conventional DOS.

IBM, Apple II, Mac	£39.95	P&P

dBCOMPILER

dBase II compiler which will convert dBase II applications into directly executable form; they then run independently of dBase. The main advantage is speed. Reviewed April 1985.

IBM, MS-DOS	£650	P&P

FANCY FONT

Print utility. Lets you produce text in a range of 19 founts and up to an inch high. Other founts are available separately on library discs. You put special Backslash commands in your WP files, which Fancy Font interprets at print time. Works with most WP programs, including WordStar, but not Multimate. Not copy protected.

IBM, MS-DOS, CP/M	£130	PCML

METATEXT

Print utility. Lets you produce high-quality text in Courier and five other typestyles on a standard matrix printer. In high-quality mode printing is slow, but Metatext lets you switch back to normal mode to produce drafts. Works with printers which use the same control codes as the Epson RX, FX and LX series, such as the IBM Graphics printer.

IBM	£95	Image

NORTON UTILITIES

Set of utilities, mainly to do with disc management. Lets you do useful things like recover data from damaged discs, restore accidentally erased files, and browse through the raw data on your discs.

IBM	£89	P&P, Softsel, First

PROKEY

Lets you set up hundreds of keystrokes as single-key macros. Works with most application programs, on both data and commands.

IBM	£114	P&P, Softsel, First

SHUTTLE

Operating-system extension for Apple IIe and II+. Lets you hold several programs in memory and switch rapidly between them, just like Mac's Switcher. Price includes Snapshot card, which is necessary for Shuttle to work. Not copy protected.

Apple II	£115	Dark Star

SIDEKICK

Memory-resident desk accessory. Runs at the same time as your main application, popping up on demand to provide on-screen notepad, calculator, calendar and other useful functions. The Mac version includes some phone functions but they do not work yet with U.K. phone system. Unprotected.

IBM, Mac	£47	P&P, Softsel, First

SIDEWAYS

Print utility. Lets you print spreadsheets, etc., sideways down the length of the paper rather than across it. Ideal for any wide document.

IBM, Apple II	£53	P&P, Softsel, First

(continued on next page)

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SPOTLIGHT

Desk-top organiser. Contains six accessories: notepad, calculator, phone book, appointments, DOS aid. More powerful than Sidekick but not as quick.

IBM	£103	P&P, Softsel, First

SUPERKEY

Keyboard enhancer. Like Prokey but with extras: lets you encrypt any file on your disc. It will work alongside Sidekick, but is more memory hungry.

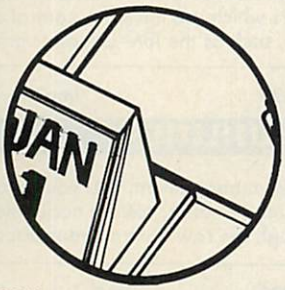
IBM	£60	P&P, Softsel, First

SWITCHER

Operating-system extension for 512K Mac. Lets you hold two or three programs in memory and switch instantly between them; also speeds up data transfer between applications. Bundled free with some applications — Excel, for instance. Unprotected.

Mac	£20	Apple

8 PROJECT PLANNERS



A FEW years ago project planners were things you had on your walls which were covered with brightly coloured strips. Today many software companies are waking up to the idea that they could represent a largely untapped business application, and one which could profitably be added to the staple spreadsheets, word processors and databases.

Project planners fall into two main categories: the simple and the not so simple. The simple ones like Brainpower are more of an introduction to the field than high-powered business tools.

The real heavyweights cost upwards of £1,000, and are designed very much with professionals in mind. They allow you to handle large numbers of activities on a project, as well as several projects at once, and produce a wide variety of displays and reports.

BRAINPOWER PROJECT PLANNER

Very simple project planner with integrated training course and clear manual, running on cheap home computers. Produces nice colour charts on-screen and gives you a grasp of the underlying ideas of project planning. Strongly recommended to any beginner thinking of buying a more expensive package. ICL OPD and IBM PC versions under development.

Amstrad, BBC, Commodore, QL	£20-£40	Triptych

HARVARD PROJECT MANAGER

Fairly simple, easy-to-use project planner with good manual. Harvard Total Project Manager is slightly more expensive package with more capacity.

IBM	£315	Softsel, First

KERNEL

Top-of the range project planner aimed at companies undertaking frequent projects. Kernel is based around a database, so you can build up a body of information common to several projects, and Kernel will extract the details as required.

IBM, MS-DOS	£4,500	UIS

MACPROJECT

Cheap and visual, Macproject is good value for money and fine for small projects.

Mac	£99	Apple

MICRO PLANNER

Very visual project-management package. Lets you produce a wide range of charts of costs, resource use and schedules, as well as print out network diagrams. One of the most easy to use of the more powerful project planners, and good value for money.

Mac	£395	Micro Planning Software

PROJECT MANAGER WORKBENCH

Expensive but very powerful project planner for large projects. The number of activities per project is limited only by disc space. Lets you produce a wide variety of displays and reports. Although you have to spend some time learning to use it, Workbench is reputedly easy once mastered. Requires plenty of memory to run well.

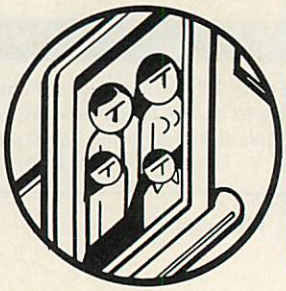
IBM, MS-DOS	£1,250	Hoskyns

SUPERPROJECT

Easy-to-use project planner. Makes good use of colour, displaying a range of charts on the IBM PC. Provides a separate calendar for each resource, and lets you transfer data across to Supercalc.

IBM	£395	Sorcim IUS

SOFTWARE FAMILIES 9



A FAMILY of related software products is likely to arise when a manufacturer wants to follow up one successful product with others in different application areas. But to bring real benefit to the user the family approach has to offer more than a mere line of branded goods. Each package in the range should work in a broadly similar way, so that learning time is reduced with each new product as a reward for sticking within the range. Data created in one package should be usable in the others.

MICROSOFT

Microsoft has been in personal computing from its beginnings, having produced the Basic interpreter for the pioneering Altair. Apart from system software such as PC-DOS and Windows, the current product line-up includes applications in all the major areas, notably Microsoft Word, Multiplan, Chart and Project for the PC, and Word, Multiplan, Chart and File for the Mac. The Sylk format Microsoft uses for passing data between packages in its range has become one of the standards for the industry. Latest product from Microsoft is Excel, a very powerful spreadsheet for the Mac.

IBM, MS-DOS Mac	£190-£400	Microsoft

PAPERBACK SOFTWARE

Adam Osborne's low-cost software range. Each program is supplied on a disc bound into the back of its manual, which allows it to be sold through booksellers and similar distribution channels. Five packages in the range work together: Executive Writer, Executive Filer, Draw-it,

Numberworks and Speller. Integration centres on the database, Executive Filer. Spreadsheet data from Numberworks, graphic images from Draw-it, and text from Writer can be held on Filer's index card style records. Copy protected, but backup discs cost only £5. The latest program from Paperback Software is a £120 Symphony clone called VP Planner.

IBM	£40-£70	Computer Frontier

PFS

PFS stands for Personal Filing System, which was the first product from this company and ran on the Apple II. PFS now does six programs for the Apple II and IBM PC: Write, File, Report, Plan, Graph and Access. File and Report are also available on the Mac. A seventh program, a spelling checker called Proof, has been incorporated in the new U.K. version of Write. All PFS programs are easy to use, and the range should take off in the U.K. now that its U.S. publisher is making a determined effort to break into the market. The spreadsheet, PFS Plan, is particularly good value.

IBM, MS-DOS, Apple II, Mac	£99-£125	First, Softsel

PRACTICORP

Family of two existing products for the IBM, with two more on the way. All are low-cost, non-copy-protected packages targeted at the market leaders. Practiword is aimed at WordStar, while Practibase closely resembles dBase II. Soon to be released are Practigraph and Practicalc II, a Lotus 1-2-3 clone. All are designed to retail at about £100 including VAT.

IBM	£87	Practicorp

SMART

Family includes seven elements: WP, spreadsheet, database, comms, time management and programming language. Highlights are the WP and the Spreadsheet, which are pitched up-market and are very powerful. Data transfer within the range is good, and the packages have a strong similarity of style.

IBM, MS-DOS	£295-£695	Innovative Software

SSI

Satellite Software International (SSI) is best known for its highly thought of Word Perfect, but also offers two programs for the IBM PC which are data compatible and use a similar command style. Mathplan is a full-feature spreadsheet with integrated graphics, and SSI Data is a multi-file database which allows variable length records. Not copy protected.

IBM	£195-£425	Sentinel Software

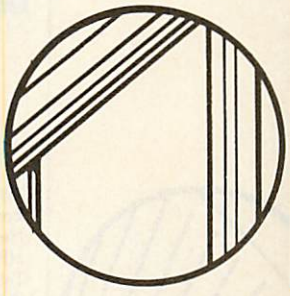
STAR RANGE

WordStar, the highly successful WP program originally written back in the days when eight-bit CP/M ruled the world, was rapidly joined by other programs from the Micropro stable. Mailmerge, Spellstar and Starindex all work directly with WordStar, using WordStar documents and accessible from within the WordStar menu structure. Calcstar is a data-compatible spreadsheet program. Datastar and Infostar are database packages. While none of these programs is wildly up-to-date in its approach, they do the job and run on a wide range of different machines, ranging from eight-bit portables like the Epson PX-8 to 16-bit MS-DOS machines. More recently Micropro has come out with several programs designed specifically for the IBM PC; these include the Easy word processor, designed for beginners and occasional users, and full-feature office-orientated WordStar 2000. While these two packages have their merits, they depart from the original WordStar in many ways, and so do not derive much benefit from its massive base of users.

IBM, MS-DOS, CP/M	£90-£465	Micropro

ENVIROMENTS 10

OPERATING-SYSTEM extensions such as Windows, Gem or Topview are all the rage. At the most trivial level they make personal-computer operating systems such as MS-DOS or PC-DOS more fun to use. Instead of typing in hard-to-remember commands, you can select from a menu or point at an icon with a mouse. But the best of these products go much further.



GEM

Gem is the most Mac-like of the operating-system extensions. In fact, DR has recently been forced to make substantial changes to keep Apple happy. Gem Desktop, price £50, is the environment from which you run applications, and the most changed as a result of Apple's pressure. It now no longer allows you to overlap windows, but still uses the desk-top metaphor with files — including existing MS-DOS files — appearing as icons. Desk accessories such as calculator, clock and a print spooler are also provided. DR also sells Gem Desktop with two application programs bundled in for £130. These are the Gem Write word processor and Gem paint, a drawing program for enhancing text and producing presentation graphics. Other Gem applications include Gem Draw, which is a proper drafting tool. Reviewed in original version August 1985.

IBM, MS-DOS, Atari 520ST	£50-£130	Digital Research

TAXI

Taxi is a bit special in several respects. First, it's British through and through. It was developed for and launched with the Epson QX-16 in April 1985 and is being bundled with that machine in the U.K. and Germany, with the U.S. and France as future possibilities. Visually it shares many of its features with the Macintosh and Gem, using icons and a menu of options, though they are placed along the bottom of the screen rather than the top. Taxi will work with unmodified MS-DOS and PC-DOS programs, unlike Gem, which requires special versions to be made. Reviewed July 1985.

IBM, Epson QX-16	£199, £265	Epson

TOPVIEW

Topview is IBM's own offering in this field, and also the one which has made the least impact. Unlike the Mac or Gem, it is almost entirely text-based. As in Microsoft's Windows, you operate it by opening up applications or utilities in new screens. But unlike Windows, Topview allows screens to overlap, which can be confusing. Considering the importance of this product, IBM's push behind it has been surprisingly restrained — so far, at least. It has even given its approval to Microsoft's competing software. However, there are suggestions that the Topview approach will be IBM's way forward in the future, and one which will one day integrate its many disparate micro and mainframe operating systems.

IBM	£156, toolkit £416	IBM

WINDOWS

Windows has been a prime example of vapourware for a long time. It was announced a long time ago, but only recently came through to end-users. Initial reactions suggest that it may well have been worth the wait. Windows uses a different technique to the Mac or Gem. As the name suggests, windows are opened for various applications or utilities. They do not overlap but form a tile-like pattern. Like Taxi, Windows will work with existing applications, and allows true multi-tasking. To be reviewed next month.

IBM, Apricot, RM Nimbus	£95	Microsoft

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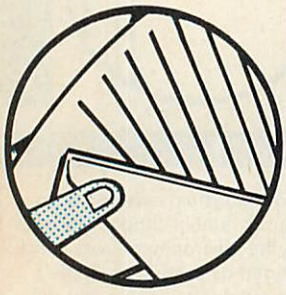
SUPPLIERS



Apple Computer (U.K.) Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ
Telephone: (0442) 60244

Ashton-Tate (U.K.) Oaklands, 1 Bath Road, Maidenhead, Berkshire SL6 1UH
Telephone: (0628) 33123.

Blyth Software Mitford House, Benhall, Saxmundham, Suffolk IP17 1JS.
Telephone: (0728) 3011.

Bristol Software Factory Thornton House, Richmond Hill, Clifton, Bristol BS8 1AT
Telephone: (0272) 735022.

Commercial Graphics International 145 Manor Road, Littleover, Derby DE3 6BU.
Telephone: (0332) 372841.

Compsoft Compsoft Manor, Farncombe Hill, Godalming, Surrey GU7 2AR.
Telephone: (04868) 25925.

Computer Frontier (U.K.) Business and Technology Centre, Bessemer Drive, Stevenage, Hertfordshire SG1 2DX
Telephone: (0438) 310163.

Dark Star Systems 78 Robin Hood Way, Greenford, Middlesex UB6 7QW
Telephone: 01-900 0104.

Dataflex (Information Management) Services 16 Anning Street, New Inn Yard, London EC2A 3HB.
Telephone: 01-729 4460.

DDL 5 King's Ride Park, Ascot, Berkshire SL5 8BP
Telephone: (0990) 28921.

Digital Research (U.K.) Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB
Telephone: (0635) 35304.

Epson (U.K.) Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH
Telephone: 01-902 8892.

First Software Intec 1, Wade Road, Basingstoke, Hampshire RG24 0NE.
Telephone: (0256) 463344.

Future Management 38 Tanners Drive, Blakelands North, Milton Keynes MK14 5LL.
Telephone: (0908) 615274.

Grafox Ltd 65 Banbury Road, Oxford 0X2 6PE.
Telephone: (0865) 516281.

Hayes Microcomputer Products (U.K.) Hayes House, The Gate Centre, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD.
Telephone: 01-847 4471.

Heyden Datasystems Heyden and Son Ltd, Spectrum House, Hillview Gardens, London NW4 2JQ.
Telephone: 01-203 5171.

Hoskyns Group 91-93 Farringdon Road, London EC1M 3LB.
Telephone: 01-831 6811.

IBM United Kingdom PO Box 32, Alencon Link, Basingstoke, Hampshire RG21 1EJ.
Telephone: 01-578 4399.

Icon Technology 9 Jarrom Street, Leicester LE2 7DH.
Telephone: (0553) 546225.

Image Computer Systems 27 Cobham Road, Ferndown Industrial Estate, Wimborne, Dorset BH21 7PE.
Telephone: (0202) 876064.

Innovative Software Southampton House, 192-206 York Road, London SW11 3SA.
Telephone: 01-223 3876.

Interactive Software Products 1-4 Lloyds Bank Chambers, The Maltings, St. Albans, Hertfordshire AL1 3HU.
Telephone: (0727) 36341.

KGB Micros 106 St Leonards Road, Windsor, Berkshire SL4 3DD.Telephone: (0753) 850111.

Lotus Development (U.K.) Consort House, Victoria Street, Windsor, Berkshire SL4 1EX.
Telephone: (0753) 840281.

McQueen Systems Miller House, 18 South Groathill Avenue, Edinburgh EH4 2LN.
Telephone: 031-343 3191.

Micro Planning Software 32 High Street, Westbury-on-Trym, Bristol BS9 3DZ.Telephone: (0272) 509417.

Micropro International Haygarth House, 28-31 High Street, London SW19 5BY.
Telephone: 01-879 1122.

Microsoft Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP.
Telephone: (0734) 500741.

PC Communications Business and Technology Centre, Bessemer Drive, Stevenage, Hertfordshire SG1 2DX.
Telephone: (0438) 316561.

P&P Micro Distributors Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU.
Telephone: (0706) 217744.

Paperlogic 12 Nottingham Place, London W1M 3FA.
Telephone: 01-935 0480.

PCML Royal Mills, Esher, Surrey KT10 8AS.
Telephone: (0372) 67282.

Practicorp Goddard Road, Whitehouse Industrial Estate, Ipswich, Suffolk IP1 5NP.
Telephone: (0473) 462721.

Sagesoft NEI House, Regent Centre, Gosforth, Newcastle upon Tyne NE3 3DS.
Telephone: 091-284 7077.

Sentinel Software Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey KT12 1PY.
Telephone: (0932) 231164.

Softsel Computer Products Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD.
Telephone: 01-568 8866.

Software Products International (U.K.) 13 Horseshoe Park Estate, Pangbourne, Berkshire RG8 7JN.
Telephone: (07357) 4081.

Sorcim-IUS Micro Software Edinburgh House, 43-51 Windsor Road, Slough, Berkshire SL1 2EQ.
Telephone: (0753) 77733.

Southdata 166 Portobello Road, London W11 2EB.
Telephone: 01-727 7564.

System C 7 Mill Street, Maidstone, Kent ME15 6XW.
Telephone: (0622) 55142.

Telesystems 3 Wycombe Road, Prestwood, Buckinghamshire HP16 0ND.
Telephone: (02406) 6365.

Thorn EMI Computer Software Thomson House, 296 Farnborough Road, Farnborough, Hampshire GU14 7NF.Telephone: (0252) 543333.

Triptych Publishing Buckingham House, Station Road, Gerrards Cross, Buckinghamshire SL9 8EL.
Telephone: (0753) 889988.

Trilex International Marketing London House, 243-253 Lower Mortlake Road, Richmond, Surrey TW9 2LL.
Telephone: 01-948 0217.

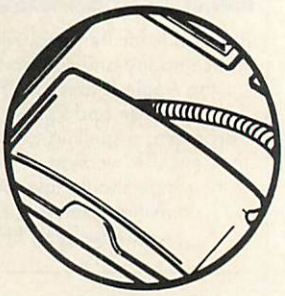
Unison Technology (Service) Suite 9C, Joseph's Well, Hanover Walk, Park Lane, Leeds LS3 1AB.
Telephone: (0532) 445951.

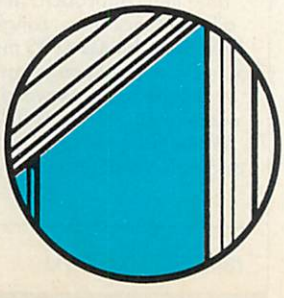
United Information Services (UIS) Apex House, 4A-10 West Street, Epsom, Surrey KT18 7RG.
Telephone: (03727) 29655.

Vuman Computer Systems Enterprise House, Manchester Science Park, Lloyd Street North, Manchester M15 4EN.
Telephone: 061-226 8311.

Wordmongers Unit 21, Edison Road, Rabans Lane, Aylesbury, Buckinghamshire HP19 3TE.
Telephone: (0296) 37878.

Xitan Xitan House, 27 Salisbury Road, Totton, Southampton SO4 3HX.
Telephone: (0703) 871211.





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Maidstone, Kent ME15 6XW.
Telephone Maidstone (0622) 55142 • Circle No. 193

Program generator or database, insist on Sycero.

(continued from page 91)

disc space on a micro are limited, and large all-in-one packages can end up cripplingly slow.

For these reasons, the tendency now is only to integrate three or four functions together. Where these are grouped around a central task such as spreadsheet analysis or data handling we have dealt with the package under the relevant heading. In fact, most modern business packages are integrated to some extent, and when not taken to extremes this can add to the usefulness of the package without over-filling the disc or slowing things down unduly.

INTEGRATED 7

Seven-in-one low-cost package from the same stable as Twin. Functions are database, mailing , spreadsheet, WP, presentation graphics, communications and terminal emulation. The database and graphics look particularly interesting on paper, though this is a new product which we have not yet seen. Not copy protected.

IBM	£595	Future Management

JAZZ

Excellent spreadsheet, plus WP, graphics database, and comms; word processor can incorporate graphs and data. Lotus has done a good job on making it easy to use, but has had to cut the help feature which makes 1-2-3 so good. Reviewed September 1985.

Mac	£495	Lotus

OPEN ACCESS

Six-in-one: excellent database, nice graphics, big spreadsheet, WP, comms and time management. All six are up to scratch, and are good for handling lots of data. Suitable for the more experienced user rather than beginners. Multi-user network version imminent. Reviewed September 1984.

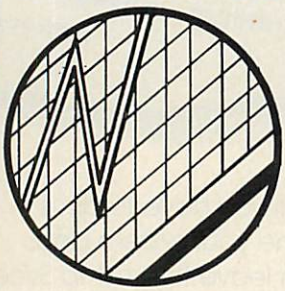
IBM, MS-DOS	£450	SPI

SYMPHONY

Spreadsheet, database, graphics, WP and comms. Ace spreadsheet, but the package is memory hungry. Many users prefer Lotus's less ambitious 1-2-3. Reviewed February 1985. Copy protected.

IBM	£595	Lotus

5 GRAPHICS



IN THE LAST year or so graphics software has improved a great deal. At the same time, a distinction has grown up between analytic and presentation graphics are handled. Analytic graphics are those functions that help with the understanding of data, and it obviously make sense to have these charting and graphing facilities integrated inside the spreadsheet or database where you do most work on your data.

AUTOCAD

Full-feature technical-drawing package. Aimed at engineers and architects, Autocad is a true drafting and design program, not a business presentation tool. It lets you build up shapes from geometric primitives and draw two-dimensional objects with accurate dimensioning. Three-dimensional objects are represented with wire-frame models. Very powerful but specialised. Not copy protected.

IBM	£1,000-£2,500	Xitan, KGB

DOODLE

Expensive but popular drawing package which lets you mix drawings in among WP documents. Works with WordStar, Multimate and other word processors or as stand-alone drawing package. Supports wide range of printers, plotters and graphic input devices.

IBM, MS-DOS	£795	Trilex

GRAPHWRITER

Extremely comprehensive presentation-graphics package. Offers fairly specialised formats like Gantt charts and bubble charts, and supports a wide range of output devices. Expensive, but very flexible. Copy protected.

IBM	£508	Softsel

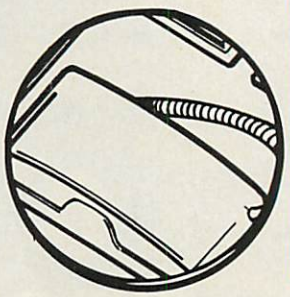
VCN EXECUVISION

Presentation-graphics package for charts, words and pictures. Lets you create the usual kinds of chart and then enhance them with pictures from a built-in image library; you don't have to be able to draw. Additional image libraries are also available. Copy protected.

IBM	£343	P&P, IBM

COMMS 6

AS OUR feature in the December issue reported, comms is currently a very active area in the business micro field. The growth in the installed user base of business micros — is now being matched by a desire to switch information between them. Comms packages fall into two main classes: file-transfer and full-blown communications software. Inevitably there is some overlap between the two.



APPLE TURNOVER

Unusual file-transfer program. Makes one of your IBM PC disc drives think it is an Apple drive. This gives you a very convenient way of reading Apple II series files into your IBM, but the process does not work the other way, from IBM to Apple.

IBM	£280	P&P

ASCOM

Flexible comms program. Good for email and terminal emulation; has good help facilities. Particularly suitable for uses with non-standard autodial modems because you can customise settings.

IBM, MS-DOS, CP/M	£170	Telesystems

BSTAM

File-transfer and comms program. Lets you transfer files between machines of same or different type, either directly or through modem. Flexible but not as easy as some other programs. The Apple version assumes you have Z-80 card and Apple CP/M.

IBM, Apple	£150	P&P

CHIT-CHAT

Comms program. Comes already set up for the most popular U.K. electronic mail and bulletin board services. Also available with autodial modem for an extra £269. Reviewed December 1985.

IBM, MS-DOS	£130	Sagesoft

CROSSTALK

Comms program. Lets you get programs and data to and from other computer systems, either down a cable or through the telephone system via a modem. Very flexible.

IBM, MS-DOS, Apple II, CP/M-80	£169	P&P Softsel, First

MISSING LINK

Comms program, supplied complete with modem card. Supports viewdata services as well as ASCII systems such as Telecom Gold. Like Chit-Chat, the advantage is that purchase is a simple one-off affair.

IBM	£499	PC Communications

PC TO MAC AND BACK

File-transfer program. Lets you move data between the IBM PC and the Mac both ways. Comes complete with cable and very complete documentation.

IBM, Mac	£138	P&P, Softsel

SMARTCOM

Comms package from major modem supplier. Works with most modems, but when used on conjunction with Hayes Smartmodem 1200 the package lets you switch easily between voice conversations and data transmission or autodialling.

IBM	£140	Hayes

TX

Lets you transfer data from one type of computer to another. You buy kit for two specific machines, consisting of two discs, manual and correct cable. Works with modems for remote comms.

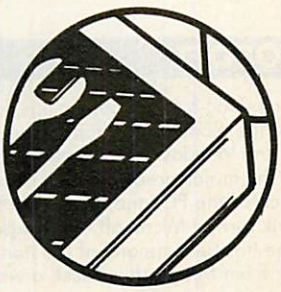
IBM, MS-DOS, CP/M	£165	Wordmongers

VICOM

Exceptionally easy-to-use comms package. Supports viewdata services as well as ASCII text services such as Telecom Gold. Uses colour on Apple II and different typestyles and shades on the Mac. Reviewed December 1985. Copy protected by key-disc method.

Mac, Apple II	£150	P&P, Softsel, First, Apple

7 UTILITIES



ANYONE making much use of a computer is eventually bound to get interested in utilities. The utilities that sell well nowadays are not the obscure and difficult programming tools that used to be popular. Rather they are simple, well-packaged programs which let you do something more quickly, more conveniently or a little differently to the way standard software allows.

COLOR SHOP

Print utility, designed for use with colour printers. Color Shop sits in memory at the same time as another software package such as Lotus 1-2-3 or Microsoft Chart and intercepts output to the printer, letting you assign colours to different parts of the image.

IBM	£79	First

COPY II

Bit copier. Lets you make backup copies of most copy-protected business software. Mac version includes many standard housekeeping functions that would be found in a conventional DOS.

IBM, Apple II, Mac	£39.95	P&P

dBCOMPILER

dBase II compiler which will convert dBase II applications into directly executable form; they then run independently of dBase. The main advantage is speed. Reviewed April 1985.

IBM, MS-DOS	£650	P&P

FANCY FONT

Print utility. Lets you produce text in a range of 19 founts and up to an inch high. Other founts are available separately on library discs. You put special Backslash commands in your WP files, which Fancy Font interprets at print time. Works with most WP programs, including WordStar, but not Multimate. Not copy protected.

IBM, MS-DOS, CP/M	£130	PCML

METATEXT

Print utility. Lets you produce high-quality text in Courier and five other typestyles on a standard matrix printer. In high-quality mode printing is slow, but Metatext lets you switch back to normal mode to produce drafts. Works with printers which use the same control codes as the Epson RX, FX and LX series, such as the IBM Graphics printer.

IBM	£95	Image

NORTON UTILITIES

Set of utilities, mainly to do with disc management. Lets you do useful things like recover data from damaged discs, restore accidentally erased files, and browse through the raw data on your discs.

IBM	£89	P&P, Softsel, First

PROKEY

Lets you set up hundreds of keystrokes as single-key macros. Works with most application programs, on both data and commands.

IBM	£114	P&P, Softsel, First

SHUTTLE

Operating-system extension for Apple IIe and II+. Lets you hold several programs in memory and switch rapidly between them, just like Mac's Switcher. Price includes Snapshot card, which is necessary for Shuttle to work. Not copy protected.

Apple II	£115	Dark Star

SIDEKICK

Memory-resident desk accessory. Runs at the same time as your main application, popping up on demand to provide on-screen notepad, calculator, calendar and other useful functions. The Mac version includes some phone functions but they do not work yet with U.K. phone system. Unprotected.

IBM, Mac	£47	P&P, Softsel, First

SIDEWAYS

Print utility. Lets you print spreadsheets, etc., sideways down the length of the paper rather than across it. Ideal for any wide document.

IBM, Apple II	£53	P&P, Softsel, First

(continued on next page)

(continued from previous page)

SPOTLIGHT

Desk-top organiser. Contains six accessories: notepad, calculator, phone book, appointments, DOS aid. More powerful than Sidekick but not as quick.

IBM	£103	P&P, Softsel, First

SUPERKEY

Keyboard enhancer. Like Prokey but with extras: lets you encrypt any file on your disc. It will work alongside Sidekick, but is more memory hungry.

IBM	£60	P&P, Softsel, First

SWITCHER

Operating-system extension for 512K Mac. Lets you hold two or three programs in memory and switch instantly between them; also speeds up data transfer between applications. Bundled free with some applications — Excel, for instance. Unprotected.

Mac	£20	Apple

8 PROJECT PLANNERS

A FEW years ago project planners were things you had on your walls which were covered with brightly coloured strips. Today many software companies are waking up to the idea that they could represent a largely untapped business application, and one which could profitably be added to the staple spreadsheets, word processors and databases.

Project planners fall into two main categories: the simple and the not so simple. The simple ones like Brainpower are more of an introduction to the field than high-powered business tools.

The real heavyweights cost upwards of £1,000, and are designed very much with professionals in mind. They allow you to handle large numbers of activities on a project, as well as several projects at once, and produce a wide variety of displays and reports.

BRAINPOWER PROJECT PLANNER

Very simple project planner with integrated training course and clear manual, running on cheap home computers. Produces nice colour charts on-screen and gives you a grasp of the underlying ideas of project planning. Strongly recommended to any beginner thinking of buying a more expensive package. ICL OPD and IBM PC versions under development.

Amstrad, BBC, Commodore, QL	£20-£40	Triptych

HARVARD PROJECT MANAGER

Fairly simple, easy-to-use project planner with good manual. Harvard Total Project Manager is slightly more expensive package with more capacity.

IBM	£315	Softsel, First

KERNEL

Top-of the range project planner aimed at companies undertaking frequent projects. Kernel is based around a database, so you can build up a body of information common to several projects, and Kernel will extract the details as required.

IBM, MS-DOS	£4,500	UIS

MACPROJECT

Cheap and visual, Macproject is good value for money and fine for small projects.

Mac	£99	Apple

MICRO PLANNER

Very visual project-management package. Lets you produce a wide range of charts of costs, resource use and schedules, as well as print out network diagrams. One of the most easy to use of the more powerful project planners, and good value for money.

Mac	£395	Micro Planning Software

PROJECT MANAGER WORKBENCH

Expensive but very powerful project planner for large projects. The number of activities per project is limited only by disc space. Lets you produce a wide variety of displays and reports. Although you have to spend some time learning to use it, Workbench is reputedly easy once mastered. Requires plenty of memory to run well.

IBM, MS-DOS	£1,250	Hoskyns

SUPERPROJECT

Easy-to-use project planner. Makes good use of colour, displaying a range of charts on the IBM PC. Provides a separate calendar for each resource, and lets you transfer data across to Supercalc.

IBM	£395	Sorcim IUS

SOFTWARE FAMILIES 9

A FAMILY of related software products is likely to arise when a manufacturer wants to follow up one successful product with others in different application areas. But to bring real benefit to the user the family approach has to offer more than a mere line of branded goods. Each package in the range should work in a broadly similar way, so that learning time is reduced with each new product as a reward for sticking within the range. Data created in one package should be usable in the others.

MICROSOFT

Microsoft has been in personal computing from its beginnings, having produced the Basic interpreter for the pioneering Altair. Apart from system software such as PC-DOS and Windows, the current product line-up includes applications in all the major areas, notably Microsoft Word, Multiplan, Chart and Project for the PC, and Word, Multiplan, Chart and File for the Mac. The Sylk format Microsoft uses for passing data between packages in its range has become one of the standards for the industry. Latest product from Microsoft is Excel, a very powerful spreadsheet for the Mac.

IBM, MS-DOS Mac	£190-£400	Microsoft

PAPERBACK SOFTWARE

Adam Osborne's low-cost software range. Each program is supplied on a disc bound into the back of its manual, which allows it to be sold through booksellers and similar distribution channels. Five packages in the range work together: Executive Writer, Executive Filer, Draw-it,

Numberworks and Speller. Integration centres on the database, Executive Filer. Spreadsheet data from Numberworks, graphic images from Draw-it, and text from Writer can be held on Filer's index card style records. Copy protected, but backup discs cost only £5. The latest program from Paperback Software is a £120 Symphony clone called VP Planner.

IBM	£40-£70	Computer Frontier

PFS

PFS stands for Personal Filing System, which was the first product from this company and ran on the Apple II. PFS now does six programs for the Apple II and IBM PC: Write, File, Report, Plan, Graph and Access. File and Report are also available on the Mac. A seventh program, a spelling checker called Proof, has been incorporated in the new U.K. version of Write. All PFS programs are easy to use, and the range should take off in the U.K. now that its U.S. publisher is making a determined effort to break into the market. The spreadsheet, PFS Plan, is particularly good value.

IBM, MS-DOS, Apple II, Mac	£99-£125	First, Softsel

PRACTICORP

Family of two existing products for the IBM, with two more on the way. All are low-cost, non-copy-protected packages targeted at the market leaders. Practiword is aimed at WordStar, while Practibase closely resembles dBase II. Soon to be released are Practigraph and Practicalc II, a Lotus 1-2-3 clone. All are designed to retail at about £100 including VAT.

IBM	£87	Practicorp

SMART

Family includes seven elements: WP, spreadsheet, database, comms, time management and programming language. Highlights are the WP and the Spreadsheet, which are pitched up-market and are very powerful. Data transfer within the range is good, and the packages have a strong similarity of style.

IBM, MS-DOS	£295-£695	Innovative Software

SSI

Satellite Software International (SSI) is best known for its highly thought of Word Perfect, but also offers two programs for the IBM PC which are data compatible and use a similar command style. Mathplan is a full-feature spreadsheet with integrated graphics, and SSI Data is a multi-file database which allows variable length records. Not copy protected.

IBM	£195-£425	Sentinel Software

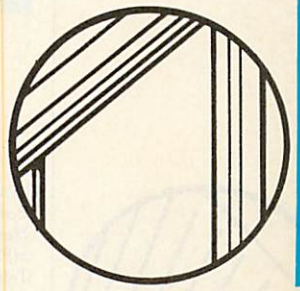
STAR RANGE

WordStar, the highly successful WP program originally written back in the days when eight-bit CP/M ruled the world, was rapidly joined by other programs from the Micropro stable. Mailmerge, Spellstar and Starindex all work directly with WordStar, using WordStar documents and accessible from within the WordStar menu structure. Calcstar is a data-compatible spreadsheet program. Datastar and Infostar are database packages. While none of these programs is wildly up-to-date in its approach, they do the job and run on a wide range of different machines, ranging from eight-bit portables like the Epson PX-8 to 16-bit MS-DOS machines. More recently Micropro has come out with several programs designed specifically for the IBM PC; these include the Easy word processor, designed for beginners and occasional users, and full-feature office-orientated WordStar 2000. While these two packages have their merits, they depart from the original WordStar in many ways, and so do not derive much benefit from its massive base of users.

IBM, MS-DOS, CP/M	£90-£465	Micropro

ENVIROMENTS 10

OPERATING-SYSTEM extensions such as Windows, Gem or Topview are all the rage. At the most trivial level they make personal-computer operating systems such as MS-DOS or PC-DOS more fun to use. Instead of typing in hard-to-remember commands, you can select from a menu or point at an icon with a mouse. But the best of these products go much further.



GEM

Gem is the most Mac-like of the operating-system extensions. In fact, DR has recently been forced to make substantial changes to keep Apple happy. Gem Desktop, price £50, is the environment from which you run applications, and the most changed as a result of Apple's pressure. It now no longer allows you to overlap windows, but still uses the desk-top metaphor with files — including existing MS-DOS files — appearing as icons. Desk accessories such as calculator, clock and a print spooler are also provided. DR also sells Gem Desktop with two application programs bundled in for £130. These are the Gem Write word processor and Gem paint, a drawing program for enhancing text and producing presentation graphics. Other Gem applications include Gem Draw, which is a proper drafting tool. Reviewed in original version August 1985.

IBM, MS-DOS, Atari 520ST	£50-£130	Digital Research

TAXI

Taxi is a bit special in several respects. First, it's British through and through. It was developed for and launched with the Epson QX-16 in April 1985 and is being bundled with that machine in the U.K. and Germany, with the U.S. and France as future possibilities. Visually it shares many of its features with the Macintosh and Gem, using icons and a menu of options, though they are placed along the bottom of the screen rather than the top. Taxi will work with unmodified MS-DOS and PC-DOS programs, unlike Gem, which requires special versions to be made. Reviewed July 1985.

IBM, Epson QX-16	£199, £265	Epson

TOPVIEW

Topview is IBM's own offering in this field, and also the one which has made the least impact. Unlike the Mac or Gem, it is almost entirely text-based. As in Microsoft's Windows, you operate it by opening up applications or utilities in new screens. But unlike Windows, Topview allows screens to overlap, which can be confusing. Considering the importance of this product, IBM's push behind it has been surprisingly restrained — so far, at least. It has even given its approval to Microsoft's competing software. However, there are suggestions that the Topview approach will be IBM's way forward in the future, and one which will one day integrate its many disparate micro and mainframe operating systems.

IBM	£156, toolkit £416	IBM

WINDOWS

Windows has been a prime example of vapourware for a long time. It was announced a long time ago, but only recently came through to end-users. Initial reactions suggest that it may well have been worth the wait. Windows uses a different technique to the Mac or Gem. As the name suggests, windows are opened for various applications or utilities. They do not overlap but form a tile-like pattern. Like Taxi, Windows will work with existing applications, and allows true multi-tasking. To be reviewed next month.

IBM, Apricot, RM Nimbus	£95	Microsoft

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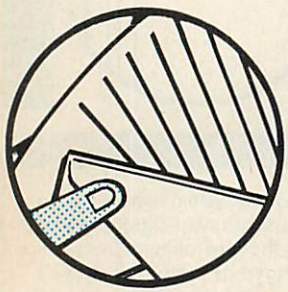
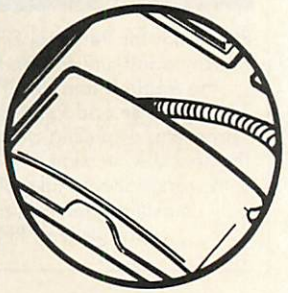
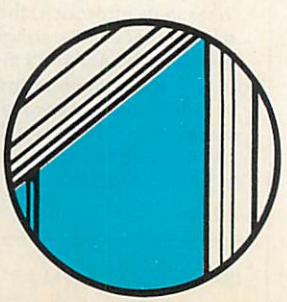
SUPPLIERS



Apple Computer (U.K.) Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ
Telephone: (0442) 60244
Ashton-Tate (U.K.) Oaklands, 1 Bath Road, Maidenhead, Berkshire SL6 1UH
Telephone: (0628) 33123.
Blyth Software Mitford House, Benhall, Saxmundham, Suffolk IP17 1JS.
Telephone: (0728) 3011.
Bristol Software Factory Thornton House, Richmond Hill, Clifton, Bristol BS8 1AT
Telephone: (0272) 735022.
Commercial Graphics International 145 Manor Road, Littleover, Derby DE3 6BU.
Telephone: (0332) 372841.
Compsoft Compsoft Manor, Farncombe Hill, Godalming, Surrey GU7 2AR.
Telephone: (04868) 25925.
Computer Frontier (U.K.) Business and Technology Centre, Bessemer Drive, Stevenage, Hertfordshire SG1 2DX
Telephone: (0438) 310163.
Dark Star Systems 78 Robin Hood Way, Greenford, Middlesex UB6 7QW
Telephone: 01-900 0104.
Dataflex (Information Management) Services 16 Anning Street, New Inn Yard, London EC2A 3HB.
Telephone: 01-729 4460.
DDL 5 King's Ride Park, Ascot, Berkshire SL5 8BP
Telephone: (0990) 28921.
Digital Research (U.K.) Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB
Telephone: (0635) 35304.
Epson (U.K.) Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH
Telephone: 01-902 8892.
First Software Intec 1, Wade Road, Basingstoke, Hampshire RG24 0NE.
Telephone: (0256) 463344.
Future Management 38 Tanners Drive, Blakelands North, Milton Keynes MK14 5LL.
Telephone: (0908) 615274.
Grafox Ltd 65 Banbury Road, Oxford 0X2 6PE.
Telephone: (0865) 516281.
Hayes Microcomputer Products (U.K.) Hayes House, The Gate Centre, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD.
Telephone: 01-847 4471.
Heyden Datasystems Heyden and Son Ltd, Spectrum House, Hillview Gardens, London NW4 2JQ.
Telephone: 01-203 5171.
Hoskyns Group 91-93 Farringdon Road, London EC1M 3LB.
Telephone: 01-831 6811.
IBM United Kingdom PO Box 32, Alencon Link, Basingstoke, Hampshire RG21 1EJ.
Telephone: 01-578 4399.
Icon Technology 9 Jarrom Street, Leicester LE2 7DH.
Telephone: (0553) 546225.
Image Computer Systems 27 Cobham Road, Ferndown Industrial Estate, Wimborne, Dorset BH21 7PE.
Telephone: (0202) 876064.
Innovative Software Southampton House, 192-206 York Road, London SW11 3SA.
Telephone: 01-223 3876.
Interactive Software Products 1-4 Lloyds Bank Chambers, The Maltings, St. Albans, Hertfordshire AL1 3HU.
Telephone: (0727) 36341.
KGB Micros 106 St Leonards Road, Windsor, Berkshire SL4 3DD.Telephone: (0753) 850111.
Lotus Development (U.K.) Consort House, Victoria Street, Windsor, Berkshire SL4 1EX.
Telephone: (0753) 840281.
McQueen Systems Miller House, 18 South Groathill Avenue, Edinburgh EH4 2LN.
Telephone: 031-343 3191.
Micro Planning Software 32 High Street, Westbury-on-Trym, Bristol BS9 3DZ.Telephone: (0272) 509417.
Micropro International Haygarth House, 28-31 High Street, London SW19 5BY.
Telephone: 01-879 1122.
Microsoft Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP.
Telephone: (0734) 500741.
PC Communications Business and Techjnology Centre, Bessemer Drive, Stevenage, Hertfordshire SG1 2DX.
Telephone: (0438) 316561.
P&P Micro Distributors Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU.
Telephone: (0706) 217744.
Paperlogic 12 Nottingham Place, London W1M 3FA.
Telephone: 01-935 0480.
PCML Royal Mills, Esher, Surrey KT10 8AS.
Telephone: (0372) 67282.
Practicorp Goddard Road, Whitehouse Industrial Estate, Ipswich, Suffolk IP1 5NP.
Telephone: (0473) 462721.
Sagesoft NEI House, Regent Centre, Gosforth, Newcastle upon Tyne NE3 3DS.
Telephone: 091-284 7077.
Sentinel Software Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey KT12 1PY.
Telephone: (0932) 231164.
Softsel Computer Products Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD.
Telephone: 01-568 8866.
Software Products International (U.K.) 13 Horseshoe Park Estate, Pangbourne, Berkshire RG8 7JN.
Telephone: (07357) 4081.
Sorcim-IUS Micro Software Edinburgh House, 43-51 Windsor Road, Slough, Berkshire SL1 2EQ.
Telephone: (0753) 77733.
Southdata 166 Portobello Road, London W11 2EB.
Telephone: 01-727 7564.
System C 7 Mill Street, Maidstone, Kent ME15 6XW.
Telephone: (0622) 55142.
Telesystems 3 Wycombe Road, Prestwood, Buckinghamshire HP16 0ND.
Telephone: (02406) 6365.
Thorn EMI Computer Software Thomson House, 296 Farnborough Road, Farnborough, Hampshire GU14 7NF.Telephone: (0252) 543333.
Triptych Publishing Buckingham House, Station Road, Gerrards Cross, Buckinghamshire SL9 8EL.
Telephone: (0753) 889988.
Trilex International Marketing London House, 243-253 Lower Mortlake Road, Richmond, Surrey TW9 2LL.
Telephone: 01-948 0217.
Unison Technology (Service) Suite 9C, Joseph's Well, Hanover Walk, Park Lane, Leeds LS3 1AB.
Telephone: (0532) 445951.
United Information Services (UIS) Apex House, 4A-10 West Street, Epsom, Surrey KT18 7RG.
Telephone: (03727) 29655.
Vuman Computer Systems Enterprise House, Manchester Science Park, Lloyd Street North, Manchester M15 4EN.
Telephone: 061-226 8311.
Wordmongers Unit 21, Edison Road, Rabans Lane, Aylesbury, Buckinghamshire HP19 3TE.
Telephone: (0296) 37878.
Xitan Xitan House, 27 Salisbury Road, Totton, Southampton SO4 3HX.
Telephone: (0703) 871211.





Powerful, single or multi user system.

ASPECT offers the database builder the facilities to set up applications quickly and simply using its powerful English-like command language. It can be run entirely via menus which provides an excellent way for the new user to learn the system, or through direct command entry.

ASPECT can read data from and output data to most other systems including accounting packages, spreadsheets and word processors. It has a report generator of such power and flexibility that this alone can justify purchasing ASPECT.

For the increasing number of organisations that are recognising the importance of linking their microcomputers together ASPECT is available in a multi-user version with the appropriate file and record locking facilities.

AVAILABLE FOR TORUS TAPESTRY, 10NET, APRICOT POINT 32 AND RML NIMBUS NETWORKS

THE ASPECT SYSTEM FEATURES

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We welcome serious software for any of the micro systems listed opposite, especially short routines and utilities. Programs can be in Basic, Pascal or any other language.

Submissions should include a brief description which explains what your program does, and how it does it. If possible it should be typed, with lines double-spaced. We need a disc of the program, and a printed listing from a fully debugged, working program; hand-written listings cannot be accepted.

When printing listings, please remember to use a new ribbon or double-intensity printing — faint listings reproduce badly. Use plain paper only, and try to list the program across either a 35-character or a 70-character width. Make sure all special graphics, inverse-video characters or any other non-standard symbols are listed correctly, or else include Rem statements to explain them.

Each program listing or disc must have your name and address on it, or we cannot promise its safe return. A stamped addressed envelope is appreciated.

If you write in with a comment, correction or enquiry please state the machine and the program title.

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FEATURES

103

MATHEMATICAL FORMULA PROCESSOR

Allan Potton's print utility sets up multi-line mathematics on a daisywheel

109

REPORT GENERATION

A program in Microsoft Basic to assemble and mark questionnaires, and translate the results into English prose

APPLE

115

UPPER-CASE CONVERTER: Code which contains lower-case characters can be modified to run on the Apple II +

APPLESOFT RESTORE: Adds the Restore command to Apple Basic

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117

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● Circle No. 170

MATHEMATICAL FORMULA PROCESSOR

Alan Potton explains how you can harness a daisywheel printer to your BBC Micro system to produce elegantly laid-out mathematical formulae with effortless ease.

TYPING complex mathematical formulae on a conventional typewriter can be a pain. Subscripts and superscripts must be positioned by moving the platen up and down manually, and all too often the required Greek or alternative characters and mathematical symbols are missing altogether and have to be written by hand.

This program allows you to set up a formula or expression on-screen, exactly as you wish it to be printed out. It is set up for use with the Juki 6100 daisywheel printer using the Triumph Adler mathematical character daisywheel, but can be modified for other printers and character sets if necessary.

The complete formula is printed in two passes: the ordinary alphanumeric characters are printed first, using any standard 12-pitch daisywheel. The program then pauses while you change daisies before making a second pass to print characters from the mathematical daisywheel.

To enter the program, first type in listing 1, but do not run it yet. Save it by typing

SAVE "GCRD"

Then type in listing 2, and save it by typing

SAVE "FPEP"

Now create a boot file by typing

*BUILD! BOOT

and entering the two commands

PAGE=&1D00
CHAIN "GCRD"

Finally type

*OPT 4 3

press Shift-Break and wait for a few seconds while the Greek character is defined. The second program then loads and runs, and the program is ready for use.

The bottom line of the editing screen displays program prompts and status information. The defaults are roman typeface, Write mode and Text Overwrite. The rest of the screen is free for you to enter your formula, which can be up to 80 characters wide. To accommodate subscripts and superscripts, each screen line corresponds to half a line on the printed page.

A pair of arrows appears on either side of the editing screen to indicate the centre line of the equation. Text is entered by typing at the cursor, which you move around the screen in the normal way using the cursor-control keys. As you type in material above and below the centre line, additional dashes appear at the side of the screen. These markers remain in place while you toggle from Roman mode to Greek mode and back, and help you to position the elements of your formula on the screen.

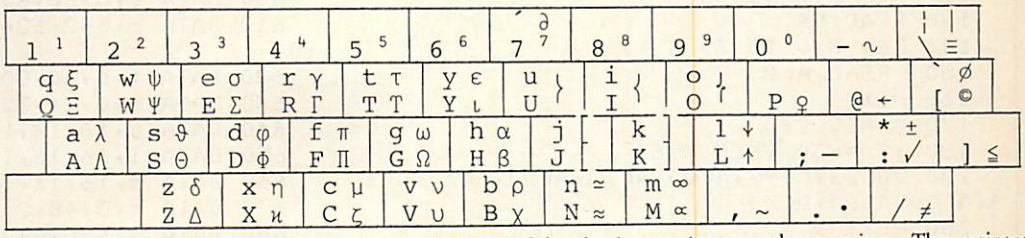

Figure 1 (above). Keyboard assignments for the Greek daisywheel.

$$\frac{1}{r}\frac{d}{dr}\left(r\frac{dE}{dr}\right) + \frac{1}{r^2}\frac{d^2E}{d\varphi^2} + (k^2n^2(r) - \beta^2)E = 0$$

$$g(t) = \int_{-\infty}^{\infty} \tau(t-t').f(t')\,dt'$$

$$\begin{pmatrix} \phi_z^- \\ E^- \\ \phi_z^+ \\ E^+ \end{pmatrix} = \begin{pmatrix} -\frac{\lambda^{11}}{\beta} J_m(\lambda_{11}a_2) & 0 \\ J_{m-1}(\lambda_{11}a_2) & 0 \\ 0 & \frac{\lambda^{11}}{\beta} J_m(\lambda_{11}a_2) \\ 0 & J_{m+1}(\lambda_{11}a_2) \end{pmatrix} \cdot \begin{pmatrix} A_1^- \\ A_1^+ \end{pmatrix} \beta\phi_z^{\pm}$$

Subscripts, superscripts, fractions and integrals are easy to set up.

FUNCTION KEYS

f0 — toggles between the roman and Greek typefaces; the current typeface is indicated on the status line at the bottom of the screen
f1 — selects the Print routine
f2 — loads a previously entered and saved equation from disc
f3 — saves the current equation to disc
f4 — toggles between Insert and Overwrite modes; the current mode is indicated on the status line
f5 — moves all text above the current cursor position up one line
f6 — moves all text below the current cursor position down one line
f7 — deletes the line on which the cursor currently lies
f9 — Reset: clears all variables to allow you to start again

In the default mode characters appear on the screen corresponding to the normal keyboard assignments. The Greek character set is selected by toggling with the f0 key to reassign the keyboard as indicated in figure 1. In this mode, the numeric keys at the top of the keyboard are assigned to superscripts and are positioned as such on printout; there is no need to raise them half a line when entering them on-screen.

When an equation or expression has been entered to your satisfaction it can be saved to disc or printed out. You enter the Print routine by pressing the f1 function key. A prompt requests the line on the page at which the centre line of the equation — marked on the screen display by the pair of arrows — is to appear, and also for the left margin. You should have a roman daisywheel in place in the printer. Pressing any key initiates printing; Escape aborts the printing routine.

When the first pass is complete, the routine issues a message telling you to change the daisywheel. It is important at this stage not to alter the paper position in any way. With the Greek-character daisywheel in place, pressing any key restarts the routine. The printer winds back the paper to the position where it started to print the first pass, and then proceeds to print characters from the Greek character set. When printing is finished, the program returns to the default mode.

The program as written runs with a Juki 6100 printer fitted with a Triumph Adler group 60-68 Symbol daisywheel for the Greek character set. For other printer/daisywheel combinations the Data statements in the character-definition program, listing 1, should be amended. To do this, first use the program as listed here to enter a representation of figure 1 on the screen; ignore the vertical lines between the key positions.

When the screen representation is complete, print it out in the normal way. Note the position of any Greek character which has been printed in the wrong position, and the roman character associated with it; this can be called "character 1". Now scan figure 1 for the keyboard position associated with the misplaced Greek character when you entered it on-screen; this can be called "character 2". Break out of the program, reload listing 1 and edit the appropriate character Data line — these lines are in the range 210 to 935. The Data line you need is the one starting with "character 1"; the only change you need to make it to alter "character 1" to "character 2".

If you have a serial printer the program will still run but will need to be amended slightly. The relevant lines and the amended code are shown in table 1.

(continued on next page)

TABLE 1

```
720   *FX 5, 2
725   *FX 8,<baudrate>
930   *FX 5, 2
935   *FX 8,<baudrate>
2015  *FX 5, 2
2017  *FX, 8<baudrate>
```

LISTING 1

```
   10 *FX20,6
   20 REM COPYRIGHT A.J.POTTON 1984
   40 MODE6
   50 PRINT "Please wait ......."
   70 A=0
   80 C=0
   90 Q=0
  100 DIMA(7)
  110 RESTORE 210
  120 FOR N=1 TO 76
  130 READ C$
  140 FOR B=0 TO 7
  150  READ A(B)
  160 NEXT
  170 C=ASC(C$)
  180 IF N=30 THEN C=61
  190 VDU23,C+95,A(0),A(1),A(2),A(3),A(4
),A(5),A(6),A(7)
  200 NEXT N
  210 DATA Q,124,68,0,124,0,68,124,0
  220 DATA W,84,84,84,56,16,16,56,0
  230 DATA E,62,18,8,4,8,18,62,0
  240 DATA R,124,36,32,32,32,32,112,0
  250 DATA T,40,84,84,16,16,16,56,0
  260 DATA Y,0,16,16,16,16,20,8,0
  270 DATA U,4,8,8,16,16,16,16,16
  280 DATA I,64,32,32,16,16,16,16,16
  290 DATA O,0,8,28,20,16,16,16,16
  300 DATA P,8,20,20,8,8,28,8,0
  310 DATA @,32,32,64,254,64,32,32,0
  320 DATA A,16,16,16,40,40,40,108,0
  330 DATA S,&3C,&42,&42,&5A,&42,&42,&3C
,0
  340 DATA D,56,16,56,84,56,16,56,0
  350 DATA F,124,40,40,40,40,40,108,0
  360 DATA G,16,40,68,68,40,170,198,0
  370 DATA H,24,36,36,56,36,36,56,32
  380 DATA J,24,16,16,16,16,16,16,24
  390 DATA K,24,8,8,8,8,8,8,24
  400 DATA L,16,56,84,16,16,16,16,0
  410 DATA ";",0,0,0,255,0,0,0,0
  420 DATA ":",0,8,8,16,80,32,32,0
  430 DATA Z,16,16,40,40,40,68,124,0
  440 DATA X,0,36,108,44,60,54,36,0
  450 DATA C,60,24,32,32,24,4,24,0
  460 DATA V,0,100,36,36,36,40,16,0
  470 DATA B,104,40,16,16,40,44,0,0
  480 DATA N,0,32,84,8,32,84,8,0
  490 DATA M,0,0,52,72,72,52,0,0
  500 DATA ",",0,0,0,36,84,72,0,0
  510 DATA ".",0,0,0,24,24,0,0,0
  520 DATA "/",4,8,124,16,124,32,64,0
  530 DATA "-",0,32,80,80,20,20,8,0
  540 DATA "\",0,120,0,120,0,120,0,0
  550 DATA "[",60,66,90,82,90,66,60,0
  560 DATA "_",0,0,0,0,0,124,0,124
  570 DATA "]",4,8,16,8,20,8,4,0
  580 DATA a,60,16,12,16,12,2,12,0
  590 DATA w,16,212,84,84,56,16,16,0
  600 DATA e,0,60,80,72,72,48,0,0
  610 DATA r,&42,&24,&18,&18,&24,&24,&18
,0
  620 DATA t,0,60,80,16,16,20,8,0
  630 DATA y,0,24,32,16,32,24,0,0
  640 DATA u,16,16,16,16,16,8,8,4
  650 DATA i,16,16,16,16,16,32,32,64
  660 DATA o,16,16,16,16,16,112,32,0
  670 DATA a,0,48,24,8,28,54,34,0
  680 DATA s,&3C,&42,&42,&7E,&42,&42,&3C
,0
  690 DATA d,16,104,84,84,56,16,16,0
  700 DATA f,0,62,84,20,20,20,20,0
  710 DATA g,0,0,40,68,84,84,40,0
  720 DATA h,0,0,52,76,72,72,52,0
  730 DATA j,24,16,16,16,16,16,16,24
  740 DATA k,24,8,8,8,8,8,8,24
  750 DATA l,16,16,16,16,84,56,16,0
  760 DATA z,8,20,16,48,72,72,48,0
  770 DATA x,0,88,36,36,36,36,4,0
  780 DATA c,0,100,36,36,36,36,88,&40
  790 DATA v,0,100,36,20,20,8,8,0
  800 DATA b,48,72,72,72,112,64,64,0
  810 DATA n,0,0,40,80,0,120,0,0
  820 DATA m,0,0,40,84,84,40,0,0
  830 DATA "1",16,16,16,16,0,0,0,0
  840 DATA "2",48,8,16,56,0,0,0,0
  850 DATA "3",56,16,8,48,0,0,0,0
  860 DATA "4",32,40,60,8,0,0,0,0
  870 DATA "5",56,48,8,48,0,0,0,0
  880 DATA "6",16,48,40,16,0,0,0,0
  890 DATA "7",56,8,16,16,0,0,0,0
  900 DATA "8",16,40,16,40,16,0,0,0
  910 DATA "9",24,40,24,8,0,0,0,0
  920 DATA "0",16,40,40,16,0,0,0,0
  930 DATA "*",16,16,124,16,16,0,124,0
  935 DATA "|",16,16,16,16,16,16,16,16
  936 DATA "'",32,16,8,56,72,72,48,0
  937 DATA "`",2,60,74,82,98,66,188,0
  940 CHAIN"FPEP"
```

LISTING 2

```
   10 VDU23,1,0;0;0;0;
   15 *FX21,0
   20 *FX 225,2
   30 *FX4,1
   40 *FX12,20
   45 *FX3,0
   60 *KEY 10 PAGE=&1D00|MOLD|MRUN|M
   70 MODE3
   80 CLS
   90 DIM LX 70:DIM RX 70:PROCCRT
  100 NL=0
  110 DIM NL(23)
  120 BF0=11:TF0=11:TF=11:BF=11
  130 COLOUR 1
  140 PRINT TAB(13,13)"MATHEMATICAL"
  150 PRINT TAB(12,14)"WORD PROCESSOR"
  160 COLOUR 1
  170 PRINT TAB(11,15);CHR$ (ASC("C")+95
);"A.J.POTTON 1984"
  180 FOR A=0 TO 2500:NEXT
  190REM ONERRORGOTO240
  200 VDU30
  210 CLS
  220 ONERROR VDU3:CLOSE#0
  230 VDU23,1,1;0;0;0;
  240 VDU31,0,24:PRINT STRING$(30," ");
:COLOUR 1:VDU31,0,24:PRINT"        MODE";
  250 VDU31,41,24:PRINT"OVERWRITE";:IO=0
  260 VDU31,22,24:PRINT "COL:  1  LINE:
11";
  270 VDU31,0,11:PRINT ">";:VDU31,79,11:
PRINT "<";
  280 X=1:Y=11
  290 VDU31,0,24:COLOUR 1:PRINT"WRITE ";
:VDU31,12,24:COLOUR 1:PRINT"ROMAN ";:VDU
31,X,Y
  300 A=GET
```

LISTING 2

```
  310 IF A=2 THEN GOTO 520
  320 IF A=3 PROCPRSET:K=GET:GOTO 710
  330 IF A=4 VDU31,0,24:PRINT "LOAD - ";
:PROCRET:GOTO 240
  340 IF A=5 VDU31,0,24:PRINT "SAVE - ";
:PROCSTO:GOTO 240
  350 IF A=6 AND IO=1 THEN O=POS:P=VPOS:
VDU31,41,24:PRINT "OVERWRITE";:VDU31,O,P
:IO=0:GOTO390
  360 IF A=6 AND IO=0 THEN O=POS:P=VPOS:
VDU31,41,24:PRINT "INSERT    ";:VDU31,O,P
:IO=1
  370 IF A=7 PROCup:GOTO 300
  380 IF A=8 PROCdown:GOTO 300
  385 IF A=9 PROCdlin:GOTO 300
  390 IF A=11 CLEAR:RUN
  400 IF A=32 AND POS<78 AND IO=1 PROCC:
A%=A:X%=POS-1:Y%=VPOS:CALL R%:GOTO500
  410 IF A=32 AND POS<78 PROCC:VDU32:GOT
O500
  420 IF A=127 AND POS>1 AND IO=1 PROCC:
X%=POS:Y%=VPOS:CALL L%:VDU31,X%-1,Y%:GOT
O500
  430 IF A=127 AND POS>1 PROCC:VDU127:GO
TO500
  440 IF A=32 OR A=127 THEN GOTO 300
  450 IF A>3 AND A<12 THEN GOTO 500
  460 IF A>135 AND A<140 THEN VDU A-128:
GOTO 500
  470 PROCC
  480 IF POS>0 AND POS<79 AND VPOS>0 AND
 VPOS<23 AND A<>127 AND IO=1 THEN A%=A:X
%=POS:Y%=VPOS:CALL R%:GOTO 500
  490 IF POS>0 AND POS<79 AND VPOS>0 AND
 VPOS<23 PRINT CHR$(A);
  500 PROCUPDATE
  510 GOTO 300
  520 GOSUB1210
  530 A=GET
  540 IF A=2 THEN GOTO 1250
  550 IF A=3 THEN PROCPRSET:GOTO 710
  560 IF A=4 VDU31,0,24:PRINT "LOAD - ";
:PROCRET:GOTO 240
  570 IF A=5 VDU31,0,24:PRINT "SAVE - ";
:PROCSTO:GOTO 240
  580 IF A=6 AND IO=1 THEN O=POS:P=VPOS:
VDU31,41,24:PRINT "OVERWRITE";:VDU31,O,P
:IO=0:GOTO530
  590 IF A=6 AND IO=0 THEN O=POS:P=VPOS:
VDU31,41,24:PRINT "INSERT    ";:VDU31,O,P
:IO=1:GOTO530
  600 IF A=11 CLEAR:RUN
  601 IF A=7 PROCup:GOTO300
  602 IF A=8 PROCdown:GOTO300
  603 IF A=9 PROCdlin:GOTO300
  610 IF A=44 THEN A=61
  620 IF A=32 AND POS<78 AND IO=1 PROCC:
A%=A:X%=POS:Y%=VPOS:CALL R%:GOTO 690
  625 IF A=32 AND POS<78 PROCC:VDU32:GOT
O690
  630 IF A=127 AND POS>1 AND IO=1 PROCC:
A%=A:X%=POS:Y%=VPOS:CALL L%:VDU31,X%-1,Y
%:GOTO690
  635 IF A=127 AND POS>1 THEN PROCC:VDU1
27:GOTO690
  640 IF A=32 OR A=127 THEN GOTO 530
  650 IF A>135 AND A<140THEN VDU A-128:G
OTO690
  660 PROCC
  670 IF POS>0 AND POS<79 AND VPOS>0 AND
 VPOS<23 AND A<>127 AND IO=1 THEN A%=A+9
5:X%=POS:Y%=VPOS:CALL R%:GOTO 690
  680 IF POS>0 AND POS<79 AND VPOS>0 AND
VPOS<23 PRINT CHR$(A+95);
  690 PROCUPDATE
  700 GOTO 530
  710 GOSUB1320:COLOUR 1:VDU31,12,24:PRI
NT"ROMAN";
  720 *FX5,1
  730 VDU2
  740 FOR A=TF TO BF
  745  PRINT STRING$(MA,CHR$(1)+" ");
  750  FOR B=1 TO 78
  760   VDU31,B,A
  770   X%=0:Y%=0
  780   A%=135
  790   C=USR(&FFF4)
  800   C=C AND &FFFF
  810   C=C DIV &100
  820   X%=C
  830   IF X%>127 THEN X%=32
  840   VDU 1,X%
  850  NEXT B
  860  VDU1,13,1,27,1,68
  870 NEXT A
  880 VDU3
  890 *FX 5,0
  900 CNT=TRUE
  910 GOSUB 1290
  920 IF CNT=FALSE GOTO 240
  930 *FX5,1
  940 VDU2
  950 FOR Z%=0 TO BF-TF
  960  VDU 1,27,1,68
  970 NEXT
  980 VDU3
  990 VDU31,12,24:PRINT"GREEK";
 1000 VDU2
 1010 FOR A=TF TO BF
 1016  PRINT STRING$(MA,CHR$(1)+" ");
 1020  FOR B=1 TO 78
 1030   VDU31,B,A
 1040   X%=0:Y%=0
 1050   A%=135
 1060   C=USR(&FFF4)
 1070   C=C AND &FFFF
 1080   C=C DIV &100
 1090   X%=C
 1100   IF X%<128 THEN X%=127
 1110   IF X%=156 THEN VDU1,44:GOTO 1150
 1120   IF X%=ASC("`")+95 THEN VDU1,27,1
,74:GOTO 1150
 1130   IF X%=ASC("'")+95 THEN VDU1,&60:
GOTO 1150
 1140   VDU1,X%-95
 1150  NEXT B
 1160  VDU1,13,1,27,1,68
 1170 NEXT A
 1174 FOR Z%=0 TO BF-TF
 1176  VDU1,27,1,68
 1178 NEXT
 1180 VDU3
 1190 *FX5,0
 1200 GOTO240
 1210 O=POS:P=VPOS
 1220 VDU 31,12,24:PRINT"GREEK";
 1230 VDU31,O,P
 1240 RETURN
 1250 O=POS:P=VPOS
 1260 VDU 31,12,24:PRINT"ROMAN";
 1270 VDU31,O,P
 1280 GOTO 300
 1290 COLOUR 3:VDU31,0,24:PRINT"CHANGE D
AISY WHEEL !!!!!!!!!!!";
 1300 C%=A
```

(continued on next page)

LISTING 2

```
 1310 A=GET
 1320 VDU31,0,24:PRINT STRING$(30," ");
 1330 IF A=65 CNT=FALSE:RETURN
 1340 VDU31,0,24:COLOUR1:PRINT"PRINT  ";
:COLOUR1:PRINT"MODE";
 1350 RETURN
 1360 DEFPROCSTD
 1370 NFD$=""
 1380  PD=1
 1390  VDU31,7,24:PRINT "FILE NAME :";ST
RING$(20," ");:VDU31,18,24
 1400  K=INKEY(0)
 1410 IF K=-1 GOTO 1400
 1420  IF K=13 GOTO 1490
 1430  VDUK
 1440 IF K=127 THEN PD=PD-1:GOTO 1400
 1450  NFD$=LEFT$((NFD$+CHR$(K)),PD)
 1460 PD=PD+1
 1470  IF PD=8 THEN GOTO 1490
 1480  GOTO 1400
 1490 ENDPROC
 1500 DEFPROCUPDATE
 1510 @%=&0002
 1520  IF VPOS<TF AND NL(VPOS)>0 THEN TF
=VPOS:PROCMARK
 1530  IF VPOS>BF AND NL(VPOS)>0 THEN BF
=VPOS:PROCMARK
 1540 IF TF=11 PROCMARK:GOTO 1580
 1550 IF NL(TF)>0 THEN PROCMARK:GOTO 158
0
 1560 TF=TF+1:IF TF=11 PROCMARK:GOTO 158
0
 1570 GOTO 1540
 1580 IF BF=11 PROCMARK:GOTO1620
 1590 IF NL(BF)>0 THEN PROCMARK:GOTO 162
0
 1600 BF=BF-1:IF BF=11 PROCMARK:GOTO 162
0
 1610 GOTO 1580
 1620  F=POS:G=VPOS
 1630   VDU31,27,24:PRINT F;:VDU31,37,24
:PRINT G;
 1640  VDU31,F,G
 1650 ENDPROC
 1660 DEFFNWHCR(XX,YY)
 1670 @%=&0004
 1680  X1=POS:Y1=VPOS
 1690  VDU31,XX,YY
 1700  A%=135:X%=0:Y%=0
 1710  CHAR=USR(&FFF4)
 1720  VDU31,X1,Y1
 1730  CHAR=CHAR AND &FFFF
 1740  CHAR=CHAR DIV &100
 1750  =CHAR
 1760 END

 1770 DEFPROCC
 1780 @%=&0004
 1790 O=POS:P=VPOS
 1800  IF A<>32 GOTO 1840
 1810   CHAR=FNWHCR(O,P)
 1820   IF CHAR<>32 AND IO=0 THEN NL(VPO
S)=NL(VPOS)-1
 1830   GOTO 1900
 1840  IF A<>127 GOTO 1880
 1850   CHAR=FNWHCR(O-1,P)
 1860   IF CHAR<>32 NL(VPOS)=NL(VPOS)-1
 1870   GOTO 1900
 1880  CHAR=FNWHCR(O,P)
 1890  IF CHAR=32 OR IO=1 THEN NL(VPOS)=
NL(VPOS)+1
 1900 ENDPROC

 1910 DEFPROCMARK
 1920  O=POS:P=VPOS
 1930  IF TFO<>11 AND TFO<>TF VDU31,0,TF
O:PRINT " ";:VDU31,79,TFO:PRINT " ";
 1940  IF BFO<>11 AND BF<>BFO:VDU31,0,BF
O:PRINT " ";:VDU31,79,BFO:PRINT " ";
 1950  IF TF=11 AND BF=11 VDU31,O,P:ENDP
ROC
 1960  IF TF<11 THEN VDU31,0,TF:PRINT"-"
;:VDU31,79,TF:PRINT "-";
 1970  IF BF>11 THEN VDU31,0,BF:PRINT"-"
;:VDU31,79,BF:PRINT "-";
 1980  VDU31,O,P
 1990 BFO=BF:TFO=TF
 2000 ENDPROC

 2010 DEFPROCPRSET
 2015  *FX5,1
 2020  LFR$=""
 2030  LFRQ=0
 2040  VDU31,0,24:PRINT STRING$(30," ")
;
 2050  VDU31,0,24:PRINT"START LINE :";
 2060  PT=1
 2070  K=INKEY(0)
 2080  IF K=-1 GOTO 2070
 2090  IF K=13 GOTO 2130:IF K=127 PT=PT-
1:VDUK:GOTO 2070
 2100  IF K>57 OR K<48 GOTO 2070
 2110  LFR$=LEFT$((LFR$+CHR$K),PT):VDUK:
PT=PT+1
 2120  GOTO 2070
 2130  IF LFR$="" ENDPROC
 2140  LFRQ=VAL(LFR$)
 2150  IF LFRQ>75 GOTO 2040
 2160 VDU2
 2165  VDU1,27,1,13,1,ASC("P")
 2170  FOR CTLF=1 TO LFRQ
 2180   VDU1,13
 2190  NEXT
 2200  FOR CTLF=1 TO 11-TF
 2210   VDU1,27,1,68
 2220  NEXT
 2230  VDU3
 2235 PROCMARGIN
 2237  PRINT STRING$(20," ");
 2240  VDU31,0,24:PRINT"PRINT  MODE  HOL
D";
 2250 ENDPROC

 2260 DEFPROCSTO
 2270  *OPT1,0
 2280  PROCSTD
 2290  CLOSE#0
 2300  IF NFD$="" ENDPROC
 2310  VDU31,0,24:PRINT "SAVING TO FILE
:";NFD$;"                    ";
 2320  FILE=OPENOUT (NFD$)
 2330  BPUT#FILE,TF
 2340  BPUT#FILE,BF
 2350  FOR B=TF TO BF
 2360   VAR%=NL(B):BPUT#FILE,VAR%
 2365   CT%=0
 2370   FOR A=1 TO 78
 2380    VDU31,A,B
 2390    VAR%=FNWHCR(A,B)
 2395    IF VAR%<>32 CT%=CT%+1
 2400    BPUT#FILE,VAR%
 2410    IF CT%=NL(B) A=78
 2415   NEXT
 2420  NEXT
 2430  CLOSE#FILE
```

```
 2440  VDU31,0,24:PRINT STRING$(30," ")
;
 2450  VDU31,1,11
 2460 ENDPROC

 2470 DEFPROCRET
 2480  *OPT1,0
 2490  PROCSTD
 2500 CLOSE#0
 2510  IF NFD$="" ENDPROC
 2520  VDU31,0,24:PRINT "READING FROM FI
LE :";NFD$;"                    "
;
 2530  FILE=OPENIN (NFD$)
 2540  TF=BGET#FILE
 2550  BF=BGET#FILE
 2560  FOR B=TF TO BF
 2570   VAR%=BGET#FILE:NL(B)=VAR%
 2575   CT%=0
 2580   FOR A=1 TO 78
 2590    VDU31,A,B
 2600    VAR%=BGET#FILE
 2605    IF VAR%<>32 CT%=CT%+1
 2610    VDU VAR%
 2620    IF CT%=NL(B) A=78
 2625   NEXT
 2630  NEXT
 2640 CLOSE#FILE
 2650  VDU31,0,24:PRINT STRING$(30," ")
;
 2660  BF0=11:TF0=11:PROCMARK
 2670  VDU31,1,11
 2680 ENDPROC

 2690 DEFPROCCRT
 2700  LOCAL I%
 2710  XX%=&70
 2720  OSWRCH=&FFEE
 2730  OSBYTE=&FFF4
 2740  FOR I%=0 TO 3 STEP 3
 2750   P%=L%
 2760   [OPTO
 2770   STX XX%
 2780   LDA #78:SBC XX%:STA XX%
 2790   .START
 2800   LDA #&87:JSR OSBYTE
 2810   LDA #8:JSR OSWRCH
 2820   TXA:JSR OSWRCH
 2830   LDA #9:JSR OSWRCH
 2840   DEC XX%:BNE START
 2850   LDA #32:JSR OSWRCH
 2860   RTS
 2870   ]
 2880  NEXT
 2890  FOR I%=0 TO 3 STEP 3
 2900   P%=R%
 2910   [OPTO
 2920   PHA
 2930   STX XX%
 2940   LDA #78:SBC XX%:STA XX%
 2950   LDA #31:JSR OSWRCH
 2960   LDA #77:JSR OSWRCH
 2970   TYA:JSR OSWRCH
 2980   .START
 2990   LDA #&87:JSR OSBYTE:TXA:PHA
 3000   LDA #9:JSR OSWRCH
 3010   PLA:JSR OSWRCH
 3020   LDA #8:JSR OSWRCH:LDA #8:JSR OSW
RCH:LDA #8:JSR OSWRCH
 3030   DEC XX%:BNE START
 3040   LDA #9:JSR OSWRCH
 3050   PLA:JSR OSWRCH
 3060   RTS
 3070   ]
 3080  NEXT
 3090 ENDPROC
 3100REM
 3110 DEF PROCup
 3120 LOCAL X%,Y%
 3130 Y%=VPOS:X%=POS
 3140 IF BF=11 AND Y%>=11 OR Y%<TF ENDPR
OC
 3150 TF=TF-1
 3160 FOR I%=TF TO Y%-1:NL(I%)=NL(I%+1):
NEXT:NL(Y%)=0
 3170 VDU28,1,Y%,78,TF,31,78,Y%-TF+1,10,
26,31,X%,Y%
 3180 IF Y%>=BF : NL(BF)=0 : BF=BF-1
 3190 PROCMARK : ENDPROC


 3200 DEF PROCdown
 3210 LOCAL X%,Y%
 3220 Y%=VPOS:X%=POS
 3230 IF TF=11 AND Y%<=11 OR Y%>BF ENDPR
OC
 3240 BF=BF+1
 3250 FOR I%=BF TO Y%+1 STEP-1:NL(I%)=NL
(I%-1):NEXT:NL(Y%)=0
 3260 VDU28,1,BF,78,Y%,31,1,0,11,26,31,X
%,Y%
 3270 IF Y%<=TF : NL(TF)=0 : TF=TF+1
 3280 PROCMARK : ENDPROC


 3290 DEF PROCdlin
 3300 LOCAL X%,Y%
 3310 Y%=VPOS:X%=POS
 3320 IF Y%<TF OR Y%>BF OR TF=BF ENDPROC
 3322 IF Y%<>11 GOTO 3330
 3324  IF BF=11 GOTO 3340 ELSE GOTO 3380
 3330 IF Y%>11 GOTO 3380
 3340  IF Y%>TF FOR I%=Y% TO TF STEP -1:
NL(I%)=NL(I%-1):NEXT
 3350  NL(TF)=0
 3360  VDU28,1,Y%,78,TF,31,1,0,11,26,31,
X%,Y%
 3370 TF=TF+1 : GOTO 3410
 3380  IF Y%<BF FOR I%=Y% TO BF+1:NL(I%)
=NL(I%+1):NEXT
 3390  NL(BF)=0
 3400  VDU28,1,BF,78,Y%,31,1,BF-Y%,10,26
,31,X%,Y%
 3405  BF=BF-1
 3410 PROCMARK : ENDPROC


 3420  DEF PROCMARGIN
 3425  VDU31,0,24:PRINT STRING$(30," ")
;:VDU31,0,24:PRINT "LEFT MARGIN :";
 3430   MA=0
 3435   MA$="":PT=1
 3440   REPEAT
 3450    A=GET
 3455    IF A=127 THEN PT=PT-1:VDUA:GOTO
 3450
 3460    MA$=LEFT$((MA$+CHR$(A)),PT)
 3462    IF A<>13 VDUA
 3465    PT=PT+1
 3470    UNTIL A<48 OR A>57
 3475    IF A<>13 GOTO 3425
 3480    MA=VAL(MA$)
 3490     IF MA>80 GOTO 3425 ELSE ENDPRO
C
```

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FREE-TEXT OUTPUT FROM QUESTIONNAIRES

Mark Cook outlines the programing techniques behind a computer questionnaire and analysis scheme which can present its results in conventional English prose.

CONVENTIONAL questionnaires use paper and pencil, and clearly have the advantage of being relatively simple to prepare and to use. Computer versions are faster — people generally do the questionnaire in half the time — and they are preferred by the subjects. Computerised questionnaires are ergonomically superior because only the question to be answered is in view, avoiding the need to keep finding your place on the answer sheet. Computer scoring is accurate, fast and comprehensive.

The routines presented in this article form part of a series of questionnaire programs prepared for the Centre for Occupational Research, which tests clients for evidence of psychological stress. They are written in Microsoft Basic for an Apricot computer.

COR's stress-screening program first presents the instructions, one sentence at a time, at the client's own pace. It includes a subroutine which presents the message

Press C to continue

Then it asks 480 questions about the client's thoughts, feelings and behaviour, to be answered True or False by pressing T or F keys. This takes on average 45 minutes. After the client has answered the first 12 questions, he or she is given an estimated time to finish, calculated from the rate of answering so far.

COR uses separate programs for asking 480 questions, and scoring

(continued on next page)

```
CPI Interpretation for Mr Smith                                Page 2
-------------------------------------------------------------------------

Mr Smith's sense of well being is fairly low. He possibly experiences
many worries and complaints, and is possibly prey to feelings of
self-doubt and disillusionment. He possibly tends to magnify any
worries and complaints that he suffers from. He possibly has major
family conflicts and pre-occupations. Mr Smith may suffer
psychosomatic illnesses and may see a large discrepancy between
himself as he is, and himself as he would like to be. He may feel
feel worried and uncertain about the future in general, and his future
in particular. Other people are likely to see Mr Smith as in poor
health and as lacking vitality.

Mr Smith's profile indicates that he appears to be suffering very mild
effects of stress, centred in the areas described above. Otherwise he
seems reasonably well adjusted to the demands of his works.

The re-test reliabilities of the CPI scales used to determine that
Mr Smith is presently working fairly efficiently range from .41 to
.85. This means that Mr Smith will PROBABLY give much the same account
of himself in six months or one year from now. However the exceptions
to the principle (of consistency of response) are precisely the people
who need to be identified, because they include the individuals who
are beginning to be affected by stress, ill-health or other factors
that will reduce their efficiency. This points to the need for
re-checks of Mr Smith's CPI profile, preferably annually. A series of
profiles is much more sensitive to deterioration in a person's health
or efficiency than a single assessment.

....

-------------------------------------------------------------------------

Centre for Occupational Research Ltd
14 Devonshire Place,  LONDON W1N 1PB
```

Figure 1. Part of a computer-generated interpretation for a fictitious Mr Smith, who has a low Well-Being score. This interpretation was generated by the fragments shown in listing 5 and listing 6. Well-Being is Mr Smith's only low score, so the overall verdict is that he is suffering only mild stress, and does not presently need any help. An annual check-up is recommended in case stress effects on Mr Smith start mounting up.

LISTING 1

After the client has answered all 480 questions, his or her answers are recorded on disc for later scoring and interpretation. It is vital to make it as difficult as possible to lose the answers, and to ensure that the client's name and sex are are recorded accurately. The instructions are designed to get the most discriminating information about the subject's name into an eight-character file name by specifying full initials, not first names, and eliminating spaces.

```
20000 REM Writing to Disk
20020 ON ERROR GOTO 22000
20030 REM
20040 REM Checking Disk Ready
20050 GOSUB 28130:FOR K=1 TO 2:PRINT:NEXT K
20060 PRINT "Ready to record subject's
responses?"
20070 PRINT:PRINT "Is the file disk in the
right hand drive?"
20080 FOR K=1 TO 2:PRINT:NEXT K:PRINT
LN$:GOSUB 28170
20090 FILE$="B:CHEKDISK.SEQ":OPEN FILE$ FOR
OUTPUT AS 1:WRITE £1,NM$:CLOSE£1
20100 REM
20110 REM Instructions
20120 GOSUB 28130:FOR K=1 TO 1:PRINT:NEXT K
20130 PRINT "Type in subject's name, with
full initials,"
20140 PRINT:PRINT "without any
punctuation,like this - M H Thatcher."
20150 PRINT:PRINT "Only first 8 letters
identify subject - ie M H Thatch."
20160 FOR K=1 TO 1:PRINT:NEXT K:PRINT
LN$:GOSUB 28170
20170 REM
20180 REM Enter Name
20190 GOSUB 28130:FOR K=1 TO 1:PRINT:NEXT K
20200 PRINT "Remember to use format -  M H
Thatcher."
```

(listing continued on next page)

LISTING 1

(listing continued from previous page)

```
20210 PRINT:PRINT "Type in name, then press
[return] key."
20220 XX=12:GOSUB 28230:INPUT"Name ";NM$
20230 IF NM$<>"" THEN GOTO 20280
20240 FOR K=1 TO 6:PRINT:NEXT K
20250 PRINT CHR$(7)+"You haven't entered a
name - try again.":GOTO 20220
20260 REM
20270 REM Enter Age
20280 GOSUB 28130:FOR K=1 TO 2:PRINT:NEXT K
20290 PRINT "Type in client's age, then press
[return] key."
20300 XX=11:GOSUB 28230:INPUT"Age ";AG$
20310 REM
20320 REM Enter Sex
20330 GOSUB 28130:FOR K=1 TO 2:PRINT:NEXT K
20340 PRINT "Type m for male, f for female,
then press [return] key."
20350 XX=11:GOSUB 28230:INPUT"Sex ";SX$:
SX$=LEFT$(SX$,1)
20360 IF SX$="M" THEN SX$="m":GOTO 20380
20370 IF SX$="F" THEN SX$="f"
20380 IF SX$="m" OR SX$="f" THEN GOTO 20440
20390 FOR K=1 TO 7:PRINT:NEXT K
20400 WRSX$="You haven't entered subject's
sex correctly - try again."
20410 PRINT CHR$(7)+WRSX$:GOTO 20350
20420 REM
20430 REM Defining File Name
20440 GOSUB 28130:FOR K=1 TO 1:PRINT:NEXT K
20450 XX=9:GOSUB 28230
20460 NN$=NM$:FF$=""
20470 FOR I=1 TO LEN(NM$):X$=LEFT$(NN$,1):
NN$=RIGHT$(NN$,LEN(NN$)-1)
20480 IF ASC(X$)<48 THEN GOTO 20540
20490 IF ASC(X$)>122 THEN GOTO 20540
20500 FOR J=1 TO 10
20510 IF ASC(X$)=PR(J) THEN GOTO 20540 ELSE
GOTO 20530
20520 NEXT J
20530 FF$=FF$+X$
20540 NEXT I
20550 IF LEN(FF$)<8 THEN FF$=FF$+LEFT$
("XXXXXXXX",8-LEN(FF$))
20570 FF$=LEFT$(FF$,8):FILE$="B:"+FF$+SF$
```

Lines 20040 to 20090 check that there is a disc in the right-hand drive, and that it is not write-protected.
Lines 20230 and 20250 check that a name has been entered, and that the operator has not pressed Return without entering a name.
Lines 20380 and 20400 to 20410 check that the subject's sex has been entered as m or f, and reject any other input.
Subroutine 28170 presents the message

Press C to CONTINUE

and waits for an answer, using Inkey$.
Lines 20460 to 20540 convert the client's name, entered by the user, into an acceptable file name. File names must conform to MS-DOS, so must contain neither spaces nor punctuation. Users persist in putting commas, stops or a hyphen in the name, so lines 20480 to 20510 search the name for these and remove them.
Line 20550 pads out the name if it is less than eight characters long; if it is longer, line 20570 shortens it to eight characters — the maximum MS-DOS can handle — before adding the extension .CPX.

(continued from previous page)

the answers. The first program asks 480 questions and gets 480 Yes/No answers. The client's answers are recorded on disc to be analysed by the scoring program. This requires detailed error trapping: MS-DOS limits the file name to eight characters and does not allow spaces and punctuation, so the program makes sure that users cannot include them. The program includes an emergency file which records successive blocks of 12 answers, in case of power failure or other accidents.

Scoring COR's stress screening inventory is quite simple. The inventory is scored for a number of scales, and each scale is scored by a key. In the paper form of the test the keys are card or plastic stencils; you line up the stencil over the answer sheet and count where the answers show through the holes in the stencil. It is a very tedious job.

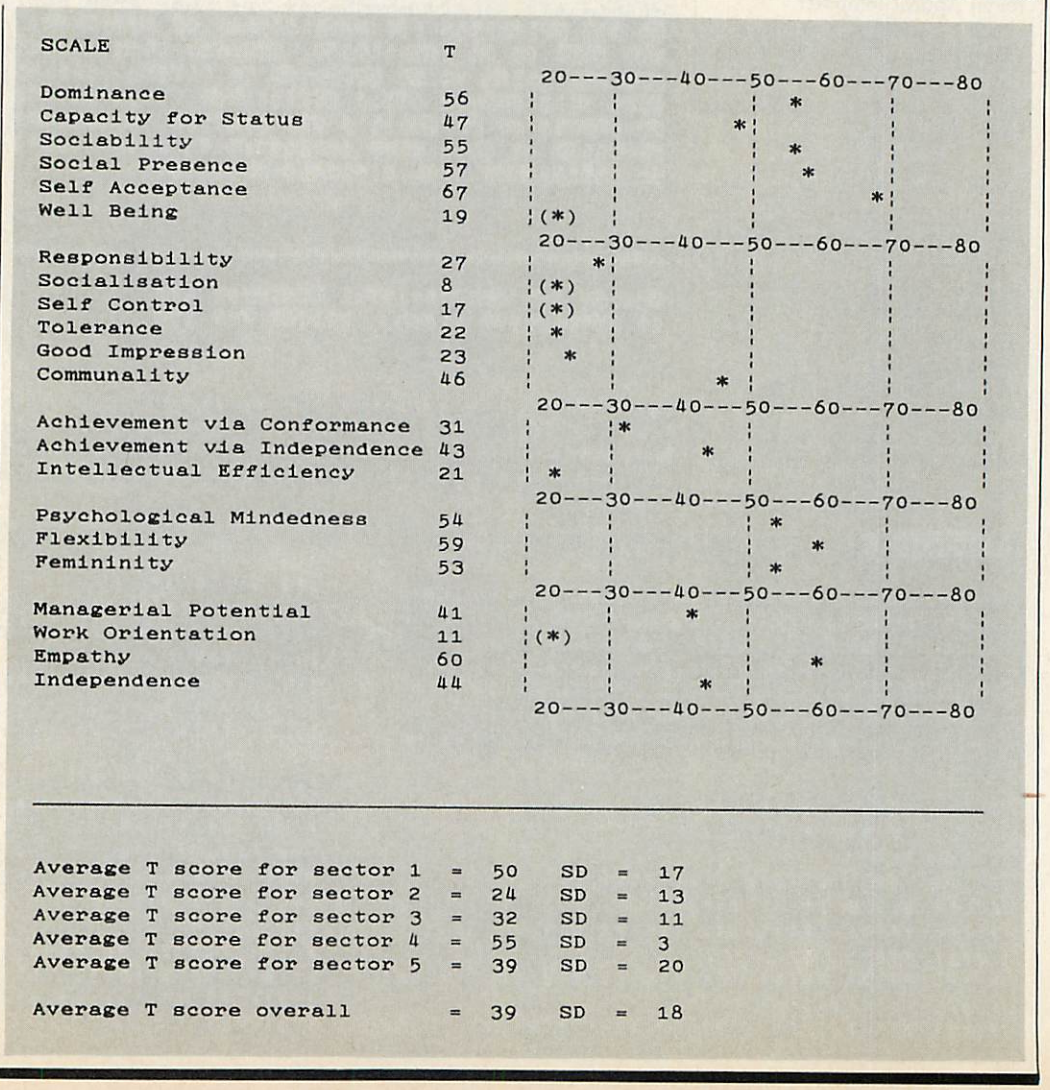
SCALE T
20---30---40---50---60---70---80
Dominance 56
Capacity for Status 47
Sociability 55
Social Presence 57
Self Acceptance 67
Well Being 19
Responsibility 27
Socialisation 8
Self Control 17
Tolerance 22
Good Impression 23
Communality 46
Achievement via Conformance 31
Achievement via Independence 43
Intellectual Efficiency 21
Psychological Mindedness 54
Flexibility 59
Femininity 53
Managerial Potential 41
Work Orientation 11
Empathy 60
Independence 44
Average T score for sector 1 = 50 SD = 17
Average T score for sector 2 = 24 SD = 13
Average T score for sector 3 = 32 SD = 11
Average T score for sector 4 = 55 SD = 3
Average T score for sector 5 = 39 SD = 20
Average T score overall = 39 SD = 18

Figure 2. Part of the printout. The raw scores generated by the scoring loop are converted into standardised scores using the score system, in which the average is set at 50 and the standard deviation at 10. Hence a score of 60 means the person falls in the top 16 percent of the population, and a score 70 means he or she falls into the top two to three percent. *Reproduced from the Californa Psychological Inventory, copyright CPP Inc. and NFER-Nelson Ltd.*

LISTING 2

The flag system gets very cumbersome when a questionnaire is scored for a lot of scales. It was discarded in favour of a loop that searches through the array of answers, indentifies the answers needed for a particular variable, and scores them.

```
11000 REM Score
11010 GOSUB 15000
11020 REM
11030 FOR I=1 TO NS
11040 SCR=0:GOSUB 16000:
PRINT"Scoring scale no"+STR$(I)+DL$
11050 rem
11060 IF LN(I,1)=0 THEN GOTO 11090
11070 FOR K=1 TO LN(I,1):X=AN(KY(I,1,K)):
SCR=SCR+FNPLUS(X):NEXT K
11080 REM
11090 IF LN(I,2)=0 THEN GOTO 11120
11100 FOR K=1 TO LN(I,2):X=AN(KY(I,2,K)):
SCR=SCR+FNMINUS(X):NEXT K
11110 rem
11120 SCR(I)=SCR:NEXT I
```

Each scoring key scores one scale. Each key has two lists: items where answering True adds 1 to the score, and items where answering False adds 1. The lists vary in length from 0 to more than 80. The list lengths LN(I, J) are read first, as Data statements or input from disc, then the two lists of items KY(I, J, K). Lines 11030 and 11060 skip to the next section, where a list has 0 items.

KY(I, J, K) selects the relevant answers, stored as + 1 and − 1, from the array AN(1 − N), using the dummy variable X. The two functions FNPlus and FNMinus convert X into 1 or 0, then add it to the running total, SCR(I), of the raw score. Defined functions are obviously much faster than using If-Then to check if the answer is True or False.

LISTING 3

This sub routine generates the main score output shown in figure 2.

```
13000 REM Print
13010 A$=FSN$(I):REM Full Scale Name
13020 B$=RIGHT$(SP$,28-LEN(A$))
13030 C$=STR$(ABC):REM T Score
13040 D$=RIGHT$(SP$,7-LEN(STR$(ABC)))
13050 E$=CHR$(124)
13060 IF ABC<20 THEN F$="(*)":
G$=SPACE$(29):GOTO 13090
13070 IF ABC>80 THEN F$=SPACE$(29)+"(*)":
G$="":GOTO 13090
13080 NSP=(ABC-20)/2
13085 F$=RIGHT$(SP$,NSP)+"*"
13087 G$=RIGHT$(SP$,32-LEN(F$))
13090 LPRINT GR$+CHR$(13);
13100 LPRINT A$+B$+C$+D$+E$+F$+G$+E$
13110 RETURN
```

FSN$(I) is the scale name. ABC is the standard score, rounded to the nearest whole number by a defined function.

Lines 13060 to 13080 print the graph.

Line 13080 prints a point on a histogram if the score falls between 20 and 80; lines 13060 and 13070 are needed when the T score is outside the range 20 to 80.

Line 13090 prints the vertical divisions of the graph, and performs a Carriage Return without Linefeed to print the scale name, score and * Lines 13020 and 13040 define the spaces between scale name and T score, and between T score and graph.

Each element is defined separately as a string variable for clarity, and the elements are joined together in line 13100.

In the computerised forms, the keys are lists of question numbers. There are two lists for each scale; one of questions where answering True scores a point, and one where answering False scores a point. Scoring keys are carefully constructed by painstaking research, but in programming terms they are effectively lists of random numbers.

In both cases the key produces a raw score which is converted into a

(continued on next page)

LISTING 4

It is often useful to sort scores in order, from highest to lowest or vice versa. Some systems for interpreting psychological tests use profile codes, listing the scores in order but listing only those that are abnormal. If nine scales are labelled 1 to 9, and a person's scores on scales 4 and 9 are abnormal, and their score on scale 4 is higher, they would be designated a 49 type.

```
31000 REM Path Code
31010 FOR I=1 TO 9
31020 MMP$=STR$(MMP(I)+200)
31030 MMP$(I)=STR$(I)+MMP$:NEXT I
31040 REM
31050 REM Sort Scales in Order
31060 FOR J=8 TO 1 STEP -1:FIN=-1
31070 FOR K=1 TO J
31072 ONE=VAL(RIGHT$(MMP$(K),3))
31074 TWO=VAL(RIGHT$(MMP$(K+1),3))
31080 IF ONE>TWO THEN GOTO 31100
ELSE GOTO 31110
31100 TEM$=MMP$(K):MMP$(K)=MMP$(K+1)
31105 MMP$(K+1)=TEM$
31110 NEXT K:IF NOT FIN THEN GOTO 31120
31120 NEXT J
31130 REM
31140 REM Coding Profile
31150 PFC$="":FOR I=9 TO 1 STEP -1
31155 SCL$="":MMM$=""
31160 SCL$=RIGHT$(MMP$(I),3)
31165 MMM$=MID$(MMP$(I),2,1)
31170 IF VAL(SCL$)<270 THEN 31190
31180 PFC$=PFC$+MMM$+" "
31190 NEXT I
31200 REM
31210 REM Print Code
31220 IF PFC$="" THEN GOTO 31250
31230 LPRINT PTH$+" (estimated) profile
abnormal"
31240 LPRINT:LPRINT PTH$+" profile code
 is:  "+EN$+PFC$:RETURN
31250 LPRINT PTH$+" (estimated) profile
normal":RETURN
```

Subroutine 3100 sorts nine scores, labelled 1 to 9, into order of size. Then it prints the scale labels — not the scores — for all scales where the score is higher than 70. The scale label corresponding to the highest score is printed first, then the others in order. This routine is used several times, sorting varying numbers of scores, from highest to lowest or from lowest to highest.

Line 31180 builds up the profile code as a string, skipping wherever the score is normal. Line 31220 checks if there is a profile code for that subject, and either prints it, or prints that the profile contains no abnormality.

LISTING 5

It is useful to have a narrative report of the assessment, as shown in figure 1. The narrative can be incorporated into a conventional typed report or written to disc for editing on a word processer.

```
11060 IF SX$="m" THEN SX1$="he":SX2$="his":
SX3$="Mr ":SX4$="He":SX5$="him"
11070 IF SX$="f" THEN SX1$="she":SX2$="her":
SX3$="Ms ":SX4$="She":SX5$="her"
11080 REM
41000 REM Well Being
41010 IF WB>39 THEN GOTO 42000
41020 IF WB<30 THEN GOTO 41040
 ELSE GOTO 41030
41030 ADV$="possibly":ADJ$="fairly low":
VB$=" may":GOTO 41050
41035 REM
41040 ADV$="very probably":ADJ$="very low":
VB$=" is likely to"
41045 REM
41050 TX$(1)=SX3$+SNM$+"'s sense of well
being is "+ADJ$+"."
41060 TX$(2)=SX4$+" "+ADV$+" experiences many
worries and complaints,"
```

(listing continued on next page)

LISTING 5

(listing continued from previous page)

```
41070 TX$(3)="and is "+ADV$+" prey to
feelings of self-doubt and"
41080 TX$(4)="disillusionment. "+SX4$+" "+
ADV$+" tends to magnify any worries"
41090 TX$(5)="and complaints that "+SX1$+
" suffers from. "+SX4$+" "+ADV$
41100 TX$(6)="has major family conflicts, as
well as sexual conflicts and"
41110 TX$(7)="pre-occupations. "+SX3$+
SNM$+VB$+" suffer psychosomatic"
41120 TX$(8)="illnesses and"+VB$+" see a
large discrepancy between"
41130 TX$(9)=SX5$+"self as "+SX1$+" is,
 and "+SX5$+"self as "+SX1$
41140 TX$(10)="would like to be. "+SX4$+
VB$+" feel worried and uncertain"
41144 TX$(11)="about the future in general,
and "+SX2$+" future in"
41146 TX$(12)="particular. Other people are
likely to see"
41150 TX$(13)=SX3$+SNM$+" as in poor health
and as lacking vitality."
41160 TEX=14:GOSUB 58000:GOSUB 55000
```

For each scale, the T scores are first sorted into three bands. If the score is over 40 — that is, within the normal range — line 41010 skips to the next section.

If the score is below average, line 41020 checks whether it is low or very low, and chooses appropriate verbs and qualifiers.

"His" and "hers", etc. are selected in lines 11060 and 11070. SNM$ is the subject's surname. The strings TX$(I) are built up using ADV$, etc., SXI$, etc., SNM$ and the interpretative text in lines 41050 to 41160.

LISTING 6

The lines of text generated by listing 5 vary in length unpredictably, because length of surname and qualifiers varies.

```
26000 REM format and output
26010 TEX=TEX+1
26020 XA$="":FOR J=1 TO TEX:A$=XA$+TX$(J)
26030 IF LEN(A$)<70 THEN XA$=A$+" ":
GOTO 26100
26040 NA$=LEFT$(A$,69):CT=0
26050 FOR K=1 TO 20:Y$=RIGHT$(NA$,1):
NA$=LEFT$(NA$,LEN(NA$)-1)
26060 IF Y$=CHR$(32) THEN K=20:GOTO 26080
26070 CT=CT+1
26080 NEXT K
26090 NL=(69-CT):RA$=LEFT$(A$,NL):
XA$=RIGHT$(A$,LEN(A$)-NL)+" ":GOTO 26110
26100 IF J=TEX THEN RA$=A$ ELSE GOTO 26120
26110 NTX$(J)=RA$
26120 NEXT J
26130 REM
26140 REM print
26160 FOR J=1 TO TEX:IF NTX$(J)=""
THEN GOTO 26190
26170 LPRINT NTX$(J):LIN=LIN+1
26180 IF LIN>49 THEN GOSUB 28000
26190 NEXT J
26200 REM
26270 REM clear text
26280 FOR J=1 TO TEX:TX$(J)="":NEXT J
26290 FOR J=1 TO TEX:NTX$(J)="":NEXT J
26300 REM
28000 REM pagination
28010 LPRINT:LPRINT LN$:LPRINT:LPRINT
CO$:LPRINT DV$:LPRINT LN$
28020 FOR K=1 TO 10-(LIN-50):LPRINT:NEXT K
28030 LPRINT LN$:LPRINT:LPRINT
REP$+SX3$+SNM$+CHR$(13);
28040 LPRINT SPACE$(60)+"Page "+STR$(PAGE):
LPRINT LN$:LPRINT:LPRINT
28050 LIN=0:PAGE=PAGE+1:RETURN
```

Subroutine 26000 checks that each printed line is not more than 70 characters long, and regulates the number of lines per page. If a line is more than 70 characters long, the subroutine truncates it at 70, checks back from the new end of the line for the first space, and sets the line as ending there.

Line 26180 and subroutine 28000 set the number of lines printed per page, and print a header and footer and a page number.

LISTING 7

Scoring a questionnaire by flags, stored in Data statements as the first two characters of a string, and split off into arrays when the Data statements are read. The flag system scores cumulatively while the subject is still answering the questionnaire, using his or her thinking time for processing the data. It gets very cumbersome when answers are scored for more than one scale, and when the number of scales an answer might be scored for varies. If answer 55 is used for only one scale, while answer 56 is used to score six, the flag method needs a lot of null flags and If-Then statements. The flag also makes it much more difficult to add a new scoring key to the program, which COR is doing continually.

Material on the screen should be double-spaced if possible, otherwise some subjects complain they have difficulty reading it. The items in this excerpt are fictitious, not part of the CPI.

```
12000 NQ=480
12010 FOR I=1 TO NQ
12020 READ S$(I,1)
12030 SC$(I)=LEFT$(S$(I,1))
12040 SC(I)=VAL(MID$(S$(I,1),2,1))
12050 QU$(I,1)=RIGHT$(S$(I,1),LEN(S$(I,1))-2)
12060 FOR J=2 TO 2
12070 READ QU$(I,2):NEXT J
12080 NEXT I
...
20000 DATA "E1I have worked with some very"
20005 DATA "unreliable people in my time."
20010 DATA "N0Some people talk a lot of
 nonsense about"
20015 DATA "things they don't understand
 at all."
20020 DATA "L1Some people will tell you
 all sorts of"
20025 DATA "lies to get you to lend
 them money."
20030 DATA "E1There is more to being an
 expert than wearing"
20035 DATA "flashy clothes and using a
 lot of long words."
```

Line 12030 splits off SC$(I), which identifies the scale being scored. Line 12040 splits off SC(I), which indicates the direction of scoring. Line 12050 defines the rest of S$(I,1) as QU$(I), the first line of the question.

The array QU$(I, J) is still used as part of the routine. On an 80-column VDU, most questions can be fitted into two lines and the Data statements in 20000 onwards determine where the question will split.

(continued from previous page)

standard score. The standard score indicates how the client compares with the rest of the population in general.

Though the basic principle of the scoring program is simple, there are many complications and refinements. Norms for men and women differ. Some of the scales have two sets of norms. The averages of the whole of the test, and of sub-sets of it, have diagnostic significance. Some of the indices are weighted combinations of four or five scores. The scores can be adjusted to take account of the client's attitude to the test.

The program also stores sets of interpretive text for each scale, and for combinations of scales, and can write an overall summary of the client's profile. The scoring program soon outgrew the 64K available to Basic in the Apricot, and had to be split first into two, and then three sections. They are run consecutively, using the Chain command.

COR's stress-screening program is marketed as Psychological Health Screening by Psychiatric & Psychological Consultant Services Ltd, 14 Devonshire Place, London W1N 1PB. Telephone: 01-935 0640. PC

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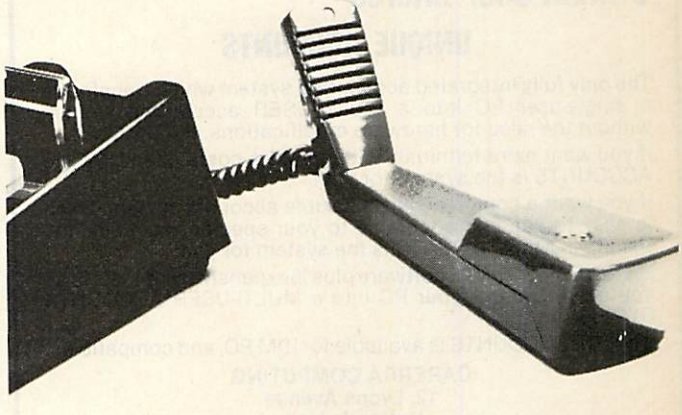

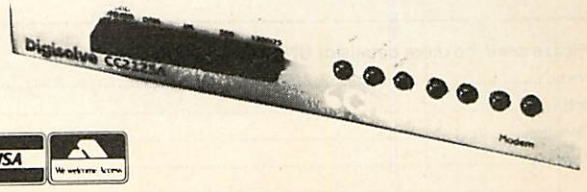

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UPPER-CASE CONVERTER

IF an Applesoft program has been written on an Apple IIe or an Apple II+ which is fitted with a lower-case modification, then there is a chance that the author will have used lower-case characters in string literals in the program. Vernon Quaintance came across such a program and had to convert all lower case to upper case so that he could run the program on his unmodified Apple II+. Rather than perform the conversion manually, he has written a short routine to do the job.

The job is not trivial since on an Apple II+ the lower-case letters appear as a jumble of numbers and symbols. You need to identify which characters are lower-case text, determine which letter each represents, and then perform the necessary conversion on them.

Check that there is no machine code appended to the program you wish to convert, and that there are no line numbers greater than 62998. Do not use this routine if there is machine code directly appended to the Applesoft program. Adding the extra lines that make up this routine will destroy any appended machine code.

Add the lines shown in the listing to your existing program. Do not modify the additional lines in any way. Once the extra lines have been added to your program, type

RUN 63000

All the lower case will be converted to upper case, and the converted program can then be run without further attention if you wish, since the End statement at line 62999 prevents the case-changing routine being rerun by accident.

In line 63000 the memory locations 103 and 104 hold the low and high bytes respectively of a pointer to the start of the program text that you wish to convert. The variable QB collects the address at which the program starts.

Locations 105 and 106 hold the low and high bytes respectively of the pointer to the start of variables in RAM. This is the same as the end of the program provided that there is no appended machine code. The added routine given contains 232 bytes. This need not be searched and the variable QF collects the address of the end of the original program text. The variable QL is then zeroed, and a message is displayed to tell the user that the routine is running. A For-Next loop is constructed with the index variable QI pointing in turn to each byte of the program to be converted.

Applesoft starts each stored line of program with a two-byte pointer to the memory location at which the next line starts. This is followed by two bytes for the line number. The program line then follows with all command words converted to tokens. Tokens are characters with the high bit set, that is with ASCII codes greater than 127. Applesoft terminates each line with a 0 byte. Since any of the first four bytes of an Applesoft line could look like a lower-case letter, the routine skips over the next four bytes if the previous byte examined is a zero, which is the end of line marker. Finally, since the program can take some time to run, the routine prints a dot on the screen to show that it is still working.

UPPER-CASE CONVERTER

```
62999  END
63000  QB = PEEK(103) + 256 * PEEK(104) : QF= PEEK(105) +
       256 * PEEK(106) - 232 : QL = 0 : PRINT "CHANGING CASE
        - PLEASE WAIT" : FOR QI = QB TO QF : IF QL = 0 THEN
       QI = QI + 4 : PRINT ".";
63010  QL = PEEK(QI) : IF (QL >= 95) AND (QL <= 122) THEN QL
       = QL - 32 : POKE QI,QL
63020  NEXT : PRINT : PRINT "DONE" CHR$(7)
```

APPLESOFT RESTORE

SOME versions of Basic allow the programmer to Restore to a given line number, and this routine from P M Doherty uses the Apple's & vector to enhance Applesoft in order to provide this facility. Run the routine in listing 1 which adds the new command to Applesoft until the machine is switched off, or until the machine code at $300 is altered. The new command can then be used as shown in listing 2 and the example run.

If the programmer does not follow the & with Restore or if a non-existent line number is specified then the computer will display an Undefined Statement error message, which can be trapped in the normal way using the Onerr Goto command if desired. PC

APPLESOFT RESTORE

LISTING 1

```
180  REM *INSTRUCTIONS:
190  REM *RUN THIS PROGRAM
200  REM *SET-UP THE '&' VECTOR A
     T 1014,1015
205  REM *TO POINT TO CODE AT $30
     0 HEX (768 DEC)
210  REM *POKE1014,0
220  REM *POKE1015,3
240  REM *BEFORE USING &RESTORE L
     INE
250  REM *N.B. LINE CAN BE ANY VA
     LID APPLESOFT
255  REM *FORMULA SUCH AS X*Y+3
260  REM *
270  REM *
280  REM *
500  REM *POKE MACHINE CODE TO ME
     MORY:
510  FOR I = 0 TO 50
520  READ X: POKE 768 + I,X
530  NEXT
600  REM *DATA:
610  DATA 201,174,208,39,32,177,0
     ,32
620  DATA 103,221,32,82,231,32,26
     ,214
630  DATA 144,25,165,80,133,123,1
     65,81
640  DATA 133,124,165,155,208,2,1
     98,156
650  DATA 198,155,165,155,133,125
     ,165,156
660  DATA 133,126,96,32,149,217,1
     62,90,76,18,212
```

LISTING 2

```
]LOAD EXAMPLE OF AMPERSAND RESTORE
]LIST

100  REM ***EXAMPLE PROGRAM
110  REM *ON USE OF &RESTORE LINE

120  REM *SET-UP '&' VECTOR
130  POKE 1014,0: POKE 1015,3
140  REM *
150  REM *N.B. IF LINE NOT FOUND
160  REM *GENERATES UNDEF'D STATE
     MENT ERROR
170  REM *
180  REM *
200  TEXT : HOME
210  PRINT : INPUT "ENTER THE LIN
     ENUMBER: ";LINE
220  &  RESTORE LINE
230  READ L$
240  PRINT : PRINT L$
250  GOTO 210
300  REM *SAMPLE DATA:
400  DATA "READ IN DATA ON LINE 4
     00"
500  DATA "READ IN DATA ON LINE 5
     00"
10000  DATA "AND FINALLY DATA FRO
     M LINE 10000"
```

EXAMPLE RUN

```
]RUN

ENTER THE LINENUMBER: 500

READ IN DATA ON LINE 500

ENTER THE LINENUMBER: 400

READ IN DATA ON LINE 400

ENTER THE LINENUMBER: 10000

AND FINALLY DATA FROM LINE 10000

ENTER THE LINENUMBER: 99

?UNDEF'D STATEMENT ERROR IN 220
]
```

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CONTROL-CODE CONVERSION

ANYONE with a non-Commodore printer will be aware, control codes included in a program can cause havoc with the printer when listing. There are several ways around this problem, and Jeremy Lloyd has come up with one useful solution.

His machine code-program will print a control character as a normal character, then backspace and underline it. Thus, any underlined characters in a listing have the same significance as the characters in reverse field on the screen.

The listing itself was prepared using the program on a Juki 6100 daisywheel printer, and a list of the control characters as printed is also given.

To switch the conversion on use

SYS 49520

and to turn it off use

SYS 49523

If your printer does not support backspace or underline, characters 8 for backspace and for 95 underline in line 5024 may be changed to suit.

CONTROL CHARACTERS

r	Reverse on	N	Upper and graphics case
R	Reverse off	h	Disable case change
s	Cursor home	i	Enable case change
S	Clear screen	b	Black
q	Cursor down	w	White
Q	Cursor up	d	Red
]	Cursor right	c	Cyan
[	Cursor left	p	Purple
E	F1	g	Green
F	F3	b	Blue
G	F5	y	Yellow
H	F7	A	Orange
I	F2	U	Brown
J	F4	V	Light Red
K	F6	W	Very Dark Grey
T	Insert	Z	Light Blue
n	Upper and lower case	[	Light Grey

CONTROL-CODE CONVERSION

```
90 print"S":read bg:b0=bg:ol=400
100 n=0:c=0
110 read a:ifa=-1goto200
115 ifa=-2thenprint"qqqsys"b0"QQQ":end
120 pokebg,a:n=n+1:c=c+a:bg=bg+1:goto110
200 read x,y
210 ifx<>nthenprint"rmissing number  at";:goto300
220 ify<>cthenprint"rcheck-sum error at";:goto300
230 print"o.k.";
300 ln=peek(63)+peek(64)*256:printol"l to"ln:ol=ln+1:goto100
5000 data 49520
5001 data 76,121,193, 76,144,193, 76,157
5002 data193,173, 38,  3,141, 24,194,173
5003 data 39,  3,141, 25,194,169,157,141
5004 data 38,  3,169,193,141, 39,  3, 96
5005 data173, 24,194,141, 38,  3,173, 25
5006 data194,141, 39,  3, 96,141, 29,194
5007 data141, 28,194,142, 26,194,140, 27
5008 data194,201, 13,240, 20,201,  0,240
5009 data-1, 64, 7135
5010 data 16,201, 10,240, 12,201, 32,144
5011 data 15,201,128,144,  4,201,160,144
5012 data  7, 32, 15,194,173, 28,194, 96
5013 data162, 64,201, 32,144,  2,162,192
5014 data160,255,200,185, 32,194,201,  0
5015 data240, 16,205, 29,194,208,243,185
5016 data 42,194,141, 29,194,162,  0, 76
5017 data239,193,173, 29,194, 41, 31,142
5018 data-1, 64, 7978
5019 data 29,194, 24,109, 29,194, 32, 15
5020 data194,173, 30,194, 32, 15,194,173
5021 data 31,194, 32, 15,194,174, 26,194
5022 data172, 27,194,173, 28,194, 96,174
5023 data 26,194,172, 27,194,108, 24,194
5024 data  0,  0,  0,  0,  0,  0,  8, 95
5025 data144,  5, 28,159,156, 30, 31,158
5026 data157,  0, 66, 87, 68, 67, 80, 71
5027 data-1, 64, 5898
5028 data 66, 89, 76,  0
5029 data-1,  4, 231,-2
```

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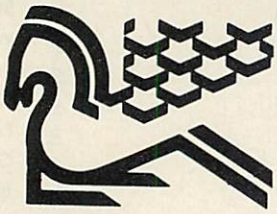

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This index covers two years of Practical Computing — January 1984 to December 1985. Entries show the volume number first, followed (in brackets) by the issue number, and finally the page number. Material which appeared in volumes 1 to 4 is indexed in the January 1982 issue; volume 5 is indexed in the January 1983 issue and volume 6 in January 1984.

A

Abbot, Bob, interview, 8 (6), 29
Accounts, 7 (15), 136
  computerised, 8 (5), 110
Acorn, second processors, review, 7 (12), 81
Acornsoft Logo, review, 8 (3), 78
Advance 86, review, 7 (6), 98
Algorithms, recursive, Software Workshop, 7 (12), 51
Alphatronic PC, 7 (5), 113
Amiga, review, 8 (10), 62
Amsoft, review, 8 (5), 86
Amstrad,
  CPC-464, review, 7 (10), 78
  CPC-664 review, 8 (6), 59
  key definer, Open File, 8 (7), 110
  PCW-8256, review, 8 (11), 82
  printers, 8 (1), 100
  WP, review, 8 (1), 100
  Z-80, news, 7 (6), 13
Amsword, review, 8 (1), 100
APL, 8 (2), 61; 8 (2), 74; 8 (5), 98
Apple,
  II as process controller, 7 (2), 86
  II book reviews, 7 (6), 171
  IIc, review, 7 (7), 68; 7 (9), 66
  IIe, 7 (5), 114
  book reviews, 8 (6), 134
  counterfeiters, news, 7 (10), 29
  Laserwriter, 8 (8), 93
  Macintosh, review, 7 (3), 88
  modem, 8 (12), 102
  speed, 7 (1), 106
Applesoft, numerical methods, Open File, 8 (5), 128
Apricot,
  F1, review, 7 (10), 86,
  F10, review, 8 (10), 67,
  portable, review, 8 (1), 70
  review, 7 (1), 76
  transfer of programs from IBM PC, Open File, 8 (8), 100
Artificial intelligence,
  book reviews, 8 (9), 43
  research in, Last Word, 7 (3), 189
  special feature, 7 (10), 115
ASCII, Software Workshop, 7 (6), 47
Atari,
  130XE, review, 8 (7), 58
  520ST, review, 8 (6), 55; 8 (9), 48
  800, 7 (5), 113
Auctions, 8 (3), 31

B

Bachus, John, interview, 7 (7), 86
Bank Street Writer, 7 (3), 52
Barron, Iann, interview, 8 (11), 69
Basic,
  Chip-Chat, 8 (3), 53
  Editorial, 8 (3), 5
  programming in, Software Workshop, 8 (8), 31
Basicode, 7 (4), 80
BBC,
  64K-128K upgrade, review, 8 (12), 86
  ADFS, review, 8 (12), 76
  B+, review, 8 (7), 56
  B+ 128K, review, 8 (12), 76
  book reviews, 7 (1), 175; 7 (5), 171, 8 (8), 121
  DDDFS, review, 8 (12), 76
  diary add-on, review, 7 (2), 77
  disassembler, Open File, 8 (1), 128
  GXR, review, 8 (12), 76
  Logos, review, 8 (3), 76
  Micro, 7 (5), 114
  Model C arrives, news, 7 (1), 16
  Multi-tasking, Open File, 8 (4), 126
  plug-ins review, 8 (12), 76
  RAM filing system, review, 7 (2), 77
  ROM routines, Open File, 8 (2), 122; 8 (3), 120; 8 (4), 142; 8 (5), 124
  software for Micro, review, 7 (10), 94
  second-processor options for micro, 7 (12), 81
BC Basic, review, 7 (6), 112
BCPL, 7 (10), 96
BDOS, Open File, 8 (12), 117
Beebpen, 7 (6), 115
Benchmarks, 8 (7), 99,
  speed, 7 (1), 102, 8 (2), 92
Binary trees, Software Workshop, 8 (1), 51
BIOS, Open File, 8 (12), 117
Bit maps, Software Workshop, 7 (9), 45
BLUG, 7 (11), 39,
  Conference, 1984, 8 (2), 61
Boilerplating, 8 (4), 108
Bonnie Blue, review, 8 (11), 109
Boom-bust, Editorial, 7 (4), 5
Brainstorm, review, 7 (7), 80
British computer market,
  Editorial, 8 (8), 5; 7 (1), 5; 7 (11) 5
British Logo User Group, 7 (1), 39,
  Conference, 1984, 8 (2), 61
British Micros, guide to, 7 (11, supplement)
Broking, use of computers in, 8 (4), 94
Budget business machines, Top 10, 7 (6), 125
Budget systems, Top 10, 8 (5), 105
Bulletin boards, 7 (12), 90
  Comms Link, 8 (1), 55; 8 (6), 49; 8 (9), 29; 8 (12), 40
Business,
  forecasting, Open File, 8 (10), 121
  graphics, special feature, 8 (9), 81
  machines, budget, Top 10, 8 (6,) 91
  software, Top 10, 8 (6), 91

C

Calcs, Editorial, 8 (12) 5
Cambridge 32016 co-processor, review, 8 (10), 68
Canon A-200, review, 8 (5), 74
Caretaker, review, 8 (3), 84
Cash Value, review, 8 (10), 77
Casu Micro-PX, review, 7 (10), 84
CB Simulator, Comms Link, 8 (4), 41
Ceefax, 7 (5), 102
Cellular radio, Comms Link, 8 (8), 35
Chauvinism, Last Word, 7 (1), 189
Chip-Chat,
  Basic, built-in, 8 (3), 53
  CP/M, cheaper, simpler, 7 (6), 43
  custom chips, 8 (9), 31
  DEC, 7 (5), 29; 8 (11), 53
  Forth, 8 (6), 37
  graphics, 7 (7), 37
  Inmos, 8 (10), 29
  Inmos Transputer, 7 (2), 35
  market forces, 7 (9), 37
  memory, 7 (1), 35; 7 (10), 57; 7 (12), 57
  Microcode, 8 (7), 35
  Motorola's 68000, 7 (11), 45
  RAM and ROM developments, 8 (8), 29
  RAM chips, 8 (1), 35; 8 (2), 51
  RISC, 8 (12), 37
  son of 6502, 7 (4), 29
  text strings, 7 (3), 35
  video chips, 8 (4), 35
  Z-80, 8 (5), 41
  6502, 7 (2), 108

(continued on next page)

(continued from previous page)

6502, son of, 7 (4), 29
68K/OS, 8 (3), 80
68000, 7 (12), 112
68000-based micros, Top 100, 7 (12), 135
6809, 7 (2), 109
8080, 7 (2), 111
8086/8 assembler, book reviews, 7 (2), 161
8088A, 7 (2), 106
9900, 7 (2), 110
custom-made, 8 (9), 31
Editorial, 8 (6), 5
market forces, 7 (9), 37
memory, Chip-Chat, 7 (1), 35
NEC's CMOS CPU, 8 (7), 35
special feature, 7 (2), 102
state of the market, Editorial, 8 (6), 5
Chit-Chat, 8 (12), 104,
Christmas shopping, Editorial, 7 (12), 5
Cleaning micros, 7 (9), 92
CMS 6502, review, 7 (12), 83
6809, review, 7 (12), 82
6502 Rack System, review, 8 (8), 58
Colne Robotics, 7 (7), 126
Columbia MPC 1600-1, 7 (6), 70
Commodore 64,
7 (5), 112;
review 7 (1), 82
book reviews, 7 (3), 177; 8 (2), 143
utilities, review, 7 (12), 87
Commstar, 8 (2), 88
Communications, special feature, 8 (12), 101
Compaq, 7 (6), 75, review, 7 (11), 54
Deskpro 286, review, 8 (8), 47
Compec 1983, news, 7 (12), 23
1984, news, 8 (1), 29
Computer auctions, 8 (3), 31
Computer Concepts' graphics ROM, review, 7 (5), 88
Computer dictionaries and encyclopaedias, reviews, 8 (11), 153
Computer Hotlines, 8 (8), 74
Computer of the year, 7 (12), 88; 7 (1), 96; 8 (12), 29
Control-character checker, Open File, 8 (11), 141
Copyright law, 8 (11), 110
CP/M, 7 (1), 84, 7 (4), 104
add-ons, 7 (5), 111
Chip-Chat, 7 (6), 43
file lister, Open File, 8 (4), 133
file transfer, Open File, 8 (1), 122
submit from MBasic, Open File, 8 (3), 116
typewriter mode, Open File, 8 (5), 133
CPMUGUK, Software Workshop, 7 (7), 45
Cursors, alternative, Open File, 8 (9), 99
Custom-built chips, Chip-Chat, 8 (9), 31
Cyber Robotics, 7 (7), 126

D

D'Addio, Michael, interview, 8 (5), 31
Data Protection Act, 8 (9), 70
Last Word, 8 (12), 135
Date General One, review, 7(12), 78
Databases, 8 (3), 101
Datavue 25, review, 8 (12), 70
dBase II add-ons, review, 8 (4), 88
dBase III, review, 7 (11), 72
Debenhams, 7 (2), 29
DEC, Chip-Chat, 7 (5), 29, 8 (11), 53
Delivery dates, Editorial, 7 (5), 5
Delta, review, 7 (4), 50
Deskmate, review, 8 (5), 82
Dictionaries, book review, 8 (11), 153
Domain, 8 (9), 87

E

E-Net, 8 (2), 88
Eagle PC Plus 2, 7 (6), 71
Easy, review, 8 (12), 89
Easylink, 8 (3), 94; 8 (12), 108
Econet, 8 (2), 87
Editorial,
Basic, 8 (3), 5
Boom to bust, 7 (4), 5
British investment, 7 (1), 5
British micro industry, 7 (12), 5
Calcs, 8 (12), 5
Chips, 8 (6) 5
Christmas shopping, 7 (12), 5
Delivery times, 7 (5), 5
Demise of British micro, 8 (8), 5
IBM, 8 (5), 5; PC, 8 (10) 5
Mainframes, 8 (11), 5
MSX invaders, 7 (9), 5
Networks, 8 (1), 5
Old faithfuls, 8 (2), 5
Optimism, 7 (10), 5
Piracy, 7 (3), 5
Prices, 7 (6), 5
Summer recess, 8 (2),5
Ten years on, 8 (4), 5
Top 10s, 7 (2), 5
VisiCalc, The next, 8 (7), 5
Work, 7 (7), 5
Education, Last Word, 7 (7), 181; 7 (11), 171; 7 (12), 191; 8 (4), 173
special feature, 8 (2), 99
Eight-bit, desk-top models, Top 100, 7 (12), 126
transportables, Top 100, 7 (12), 125
Eight/16-bit micros, Top 100, 7 (12), 127
Einstein, 7 (11), 69
Electronic brain, Last Word, 7 (2), 173
Electronic mail, 7 (12), 90; 8 (3), 92; 8 (12), 107
Last Word, 8 (1), 173
Electronic office, Last Word, 8 (6), 141
Encyclopaedias, book review, 8 (11), 153
Enterprise, review, 8 (2), 72; 8 (3), 70
Entrepreneur, 8 (1), 110
Epson,
LX-80, 8 (8), 89
PX-8, review, 7 (7), 64
QX-16, review, 8 (7), 60
Ericsson,
PC, review, 8 (2), 70
Portable PC, review, 8 (7), 62
ES/P Advisor, 7 (10), 120
Euromouse Contest 1984, 7 (9), 29
Excel, 8 (11), 128
Expandable systems, Top 10, 7 (7), 109
Expert systems, 7 (3), 108; 7 (10), 118
Expert-Ease, review, 7 (3), 108

F

Factfinder, 8 (7), 73
Feedback Instruments, 7 (7), 127
Ferranti PC-860, review, 8 (9), 50
Filevision, review, 8 (1), 104
Forecaster, review, 8 (9), 67
Forth, 7 (10), 94
Forth-based microprocessors, Chip-Chat, 8 (6), 37
Foster, Roger, Interview, 7 (11), 80
Fractal generator, Open File, 8 (12), 114
Framework, review, 8 (2), 80
Free-text datebases, Software Workshop, 8 (6), 43
Friday, review, 7 (6), 110
Fujitsu 16S, review, 8 (1), 76
Future FX-20, 7 (6), 72
Future Technology PCi, review, 7 (10), 73

G

Gates, Bill, news, 8 (1) 32
interview, 8 (8), 81
Gem Desktop, review, 8 (8), 50
Gold, 8 (12), 108
Goupil 3PC, 8 (6), 64
Graphics,
adds-ons, 8 (9), 89
Chip-Chat, 7 (7), 37
for business, special feature, 8 (9), 81
programs, 8 (9), 88
Grid, 7 (5), 133
Gridcase, review, 8 (7), 62
Grid Compass, review, 7 (5), 90
Gypsy, review, 7 (7), 55

H

Handwritten input, 7 (9), 104
Hanover Fair 1984, 7 (6), 29
Hashed tables, Software Workshop, 7 (5), 35
Hazchem, Comms Link, 8 (7), 41
Headstart ATS, review, 8 (6), 68; 8 (7), 64
Helix, review, 8 (6), 82
Hewlett-Packard,
150, review, 7 (5), 84
Gypsy, review, 7 (7), 55
Laserjet, review, 7 (11), 112
Thinkjet, review, 7 (11), 112
Vectra, review, 8 (12), 68
Hitachi, new eight-bit chip, Chip-Chat, 8 (5), 41
Hit-Bit, 8 (2), 67
Home/serious micros, Top 100, 7 (12), 114
Hot 100 micros, special feature, 7 (12), 109
Howe, Eric, interview, 8 (10), 87
Hulk, review, 7 (3), 108

I

IBM
80286-based PC launch, news, 7 (10), 21
and compatibles, special feature, 8 (6), 96
book reviews, 7 (2), 161; 7 (9), 154; 8 (4), 167
compatibles, Top 10, 8 (7), 81
Editorial, 8 (5), 5
PC/AT, review, 7 (12), 72; 7 (6), 88
PC, Asian look-alikes, 7 (6), 88
PC, Editorial, 8 (10), 88
PCjr, 7 (1), 29; review, 7 (2), 50
PC mouse review, 7 (1), 88
Portable, review, 7 (11), 53
Quietwriter, review, 8 (12), 75
software to copy, 8 (12), 82
software for PC, 7 (6), 66
special feature, 7 (6), 67
transfer of PC programs to Apricot, Open File, 8 (8), 100
IBMulators,
desk-top, Top 100, 7 (12), 133
transportable, Top 100, 7 (12), 128
Which Computer? Show, news, 8 (3), 29
Inmos, Chip-Chat, 8 (10), 99
Transputer, Chip-Chat, 7 (2), 35
Input devices, special feature, 7 (9), 99
routines, Open File, 8 (9), 92
Insurance for micros, 7 (2), 80
Integrated packages, Top 10, 8 (10), 93
Integrated software, special feature, 7 (5), 125
Interfacing,
on Apple II, 7 (2), 87
Small Computer Systems Interface, 8 (5), 94
Interviews,
Abbott, Bob, 8 (6), 29
Bachus, John, 7 (7), 86
Barron, Iann, 8 (11), 69
D'Addio, Michael, 8 (5), 31
Foster, Roger, 7 (11), 80
Gates, Bill, 8 (8), 81
Howe, Eric, 8 (10), 87
Lamond, Fred, 8 (7), 31
Moore, Charles, 7 (7), 86
Osborne, Adam, 8 (9), 69
Sugar, Alan, 8 (12), 91
Tramiel, Jack, 8 (4), 31
ITT Xtra, review, 7 (10), 73

J

Jack, 7 (6), 80
Jane, review, 7 (7), 72
Jazz, review, 8 (9), 54; 8 (12), 102

K

K-sample test, Open File, 8 (10), 116
Kaypro,
10, review, 7 (4), 68
2000, review, 8 (11), 90
286i, 8 (8), 47
Keyboards, Patents, 7 (9), 39

index 84/85

L

Lamond, Fred, interview, 8 (7), 31
LANs,
  Editorial, 8 (1), 5
  in schools, 8 (2), 86
  special feature, 8 (7), 88
Lap portables, Top 100, 7 (12), 119
Laser discs, 8 (10), 110
Laser printers,8 (8), 92
Laserjet, 7 (11), 112
LCSI Logo, review, 8 (3), 76
Liberator, review, 8 (10), 60
Lightyear, review, 8 (7), 69
Lisp, 7 (10), 129; 7 (10), 195
Logistix, review, 8 (12), 78
Logo, 7 (10), 96
Lotus,
  1-2-3, review, 7 (1), 70; 8 (9), 85
  book reviews, 7 (12), 176
  Jazz, review, 8 (9), 54
LSL Logo, review, 8 (3), 76

M

Mac, 7 (5), 132
Macbusiness, 8 (4), 116
Mac Charlie, review, 8 (11), 93
Macdraw, 8 (9), 86
Machine learning, 7 (10), 123
Machine-code subroutines, Open File, 8 (8), 102; 8 (12), 117
Macintosh, review, 7 (3), 88
Macwrite, 8 (4), 112
Magic, 8 (5), 78
Magic Spell, review, 7 (1), 90
Mail-merge, 8 (4), 108
Mainframes, Editorial, 8 (11), 5
Maintenance, cleaning micros, 7 (9), 92
Market forces, Chip-Chat, 7 (9), 37
Mass storage, review, 7 (1), 80
  special feature, 8 (10), 100
MBasic, Open File, 8 (12), 117
Medicine, 7 (4), 74
Memory,
  Chip-Chat, 7 (1), 35; 7 (10), 57; 7 (12), 57; 8 (8), 29
Menus, Prompts and, Software Workshop, 7 (3), 38
Mice, 7 (1), 88
MicroAPL, review, 8 (2), 74
Microcode, Chip-Chat, 8 (7), 35
Microcomputers, 10th birthday, Editorial, 8 (4), 5
Micros,
  16-bit, Top 80, 7 (4, supplement)
  Guide to Great British, 7 (11, supplement)
  Top 100, 7 (12), 109
Microsoft Word 2.0, review, 8 (9), 57
Microspell, review, 7 (1), 94
Microtext, 7 (10), 97; review, 8 (9), 64
Miditrack, review, 7 (11), 70
Modems, 7 (10), 35
  Comms Link, 7 (12), 59
Modular programming, Software Workshop, 8 (7), 37
Money programs, special feature, 8 (5), 109
Moore, Charles, interview, 7 (7), 86
Motorola's 68000, Chip-Chat, 7 (11), 45
MPC 1600-1, 7 (6), 70
MS-DOS, 7 (1), 84; 7 (4), 110
  Last Word, 8 (8), 125
  Micros, Top 100, 7 (12), 134
MSX, Editorial, 7 (9), 5
Mule, 8 (2), 99
Multi-tasking, Software Workshop, 7 (4), 35
Multi-user micros, Top 10, 8 (11), 115
Multi-user systems, Top 100, 7 (12), 141
Multimate, 7 (3), 60
Multiple-choice test analyser, Open File, 8 (6), 112
Multitech, MPF-PC, 7 (6), 88
Music,
  Software, 8 (9), 60
  Works, review, 8 (8), 70

N

Natural language, 7 (10), 125
NEC PC-8201, review, 7 (2), 74
Nectarring, 8 (7), 94
Networks, Editorial, 8 (1), 5
  special features, 8 (3), 91; 8 (7), 88
Nimbus, review, 8 (3), 62
Non-IBMulators, Top 10, 8 (8), 77
Nostalgia, Last Word, 7 (10), 187

O

Octopus, review, 7 (2), 66
Okimate 20, review, 8 (5), 80
Old faithfuls, Editorial, 8 (2), 5
Olivetti,
  M-21, review, 7 (11), 55
  M-24, review, 7 (5), 78; 7 (6), 74
Omni-Reader, review, 8 (8), 57
One Per Desk, review, 8 (4), 75
Online Information Centre, Comms Link, 8 (11), 61
Open File,
  Amstrad key definer, 8 (7), 110
  Applesoft, numerical methods, 8 (5), 128
  BBC Basic, multi-tasking, 8 (4), 126
  BBC disassembler, Open File, 8 (1), 128
  BBC ROM routines, 8 (2), 122; 8 (3), 120; 8 (4), 142; 8 (5), 124
  BDOS and BIOS, 8 (12), 117
  business forecasting, 8 (10), 121
  control-character checker, 8 (11), 141
  CP/M file lister, 8 (4), 133
  CP/M file transfer, 8 (1), 122
  CP/M Submit from MBasic, 8 (3), 116
  CP/M typewriter mode, 8 (5), 133
  CP/M word count, 8 (7), 115
  cursors, alternative, 8 (9), 99
  fractal generator, 8 (12), 114
  input routines, 8 (9), 92
  K-sample test, 8 (10), 116
  machine-code subroutines, 8 (8), 102; 8 (12), 117
  MBasic, 8 (12), 117
  multiple-choice test analyser, 8 (6), 112
  program portability, 8 (8), 100
  scheduling, 8 (3), 112
  stock control, 8 (11), 137
  Warnier approach, 8 (6), 118; 8 (7), 106
  WordStar, 8 (12), 125
  WordStar, control-character checker, 8 (11), 141
  WordStar, double columns, 8 (2), 127
  WordStar, proportional spacing, 8 (6), 116
Open Access, review, 7 (7), 76, 7 (9), 76
Operating systems, 7 (1), 84
  68K/OS, 8 (3), 80
  special feature, 7 (4), 100
Optimem 1000, 7 (1), 80
Optimism, Editorial, 7 (10), 5
Options, review, 8 (6), 72
Organmaster, review, 7 (11), 70
OS-9, review, 7 (9), 80
Osborne, Adam, interview, 8 (9), 69
Oz, review, 7 (3), 106

P

Packet Switch Stream, Comms Link, 8 (3), 55
Pascal, 7 (10), 95
  book reviews, 8 (7), 51
Patents, Patents Progress, 7 (6), 41; 7 (9), 39; 7 (10), 59
PC-16, review, 7 (10), 76
PC User Show, 1985, 8 (9), 23
Peeko-Computer, 7 (10), 97
Penman, review, 8 (9), 52
Peoplelink, Comms Link, 8 (10), 41
Perfect Writer II, review, 8 (6), 74
Philips Yes, review, 8 (11), 88
Phonetic sorts, Software Workshop, 8 (5), 45
Pick, 7 (4), 112
Picture input, 7 (9), 108
Pinnacle, review, 8 (1), 74
Piracy, 8 (11), 110,
  Editorial, 7 (3), 5
  Last Word, 7 (6), 177
  news, 8 (1), 32
Plink, Comms Link, 8 (10), 41
Pocketables,
  Top 10, 7 (2), 99
  Top 100, 7 (12), 118
Police, LANS and, 8 (8), 102
Portables,
  Top 100, 7 (12), 120
  Battery, Top 10, 7 (3), 127; 8 (4), 99
Power software, special feature, 8 (11), 121
Power supply, 7 (5), 116
Powertran Cybernetics, 7 (7), 127
Prestel, 7 (6), 132; 8 (3), 92; 8 (12), 105
Printers,
  daisywheels, 7 (11), 108
  dot matrix, 7 (11), 106
  special features, 7 (11), 101; 8 (8), 85
  Top 10, 8 (12), 97
Prodos, review, 7 (7), 70
Professional Composer, review, 8 (8), 70

(continued on next page)

(continued from previous page)
Program portability, Open File, 8 (8), 100
Programming,
advanced, book review, 7 (4), 143
in C, book review, 8 (10), 49
Prolog, 7 (10), 129
Prompts, and menus, Software Workshop, 7 (3), 38
Proportional spacing, WordStar, Open File, 8 (6), 116
PSS, 8 (3), 92; 7 (3), 92
Public Networks, special feature, 8 (3), 91
Publishing, 7 (3), 92
Punched cards, Software Workshop, 8 (2) 53

R

RAM and ROM developments, Chip-Chat, 8 (8), 29
RAM chips, Chip-Chat, 8 (1), 35; 8 (2), 51
Rbase 5000, 8 (11), 125
Recursive algorithms, Software Workshop, 7 (12), 51
Reduced Instruction Set, Chip-Chat, 8 (12), 37
Reflex, 8 (11), 124
Rescue, review, 7 (4), 50
Reviews — books,
8086/8 assembler, 7 (2), 161
Apple 8 (6), 134
Apple II, 7 (6), 171; 8 (6), 134
artificial intelligence, 8 (9), 43
BBC, 7 (1), 175; 7 (5), 171; 8 (8), 121
C, 8 (10), 49
Commodore, 7 (3), 177; 8 (2), 143
dictionaries and encyclopaedias, 8 (11), 153
general interest, 7 (11), 157
IBM, 7 (2), 161; 7 (9), 154; 8 (4), 167
Lotus 1-2-3, 7 (12), 176
Pascal, 8 (7), 51
programming techniques, 7 (4), 143
reference, 8 (11), 153
Sinclair QL, 8 (1), 167
Supercalc, 8 (5), 53
Unix, 7 (12), 176
VisiCalc, 8 (3), 137
word processing, 8 (12), 58
Reviews — hardware,
Acorn second processors, 7 (12), 81; 8 (10); 68
Advance 86, 7 (6), 98
Amiga, 8 (10), 62
Amstrad CPC-464, 7 (10), 78
Amstrad CPC-664, 8 (6), 59
Amstrad PCW-8256, 8 (11), 82
Apple IIc, 7 (7), 68; 7 (9), 66
Apple Macintosh, 7 (3), 88
Apricot F1, 7 (10), 86
Apricot F10, 8 (10), 67
Apricot portables, 8 (1), 70
Apricot, 7 (1), 76
Atari 130XE, 8 (7), 58
Atari 520ST, 8 (6), 55; 8 (9), 48
BBC add-ons, 7 (12), 81
BBC B+, 8 (7), 56
BBC plug-ins, 8 (12), 76
Canon A-200, 8 (5), 74
Casu Micro-PX, 7 (10), 84
CMS 6502, 7 (12), 83
CMS 6809, 7 (12), 82
CMS 6502 Rack System, 8 (8), 58
Commodore SX-64, 7 (1), 82
Compaq Deskpro 286, 8 (8), 47
Compaq, 7 (11), 54
Datavue 25, 8 (12), 70
Einstein, 7 (11), 69
Epson LX-80, 8 (8), 89
Epson PX-8, 7 (7), 64
Epson QX-16, 8 (7), 60
Ericsson PC, 8 (2), 70
Ferranti PC-860, 8 (9), 50
FTS PCi, 7 (10), 73
Fujitsu 16S, 8 (1), 76
Goupil 3PC, 8 (6), 64
Grid Compass, 7 (5), 90
Gypsy, 7 (7), 55
Headstart ATS, 8 (6), 68; 8 (7), 64
Hit-Bit, 8 (2), 67
Hewlett-Packard 150, 7 (5), 84
Hewlett-Packard Gypsy, 7 (7), 55
Hewlett-Packard Vectra, 8 (12), 68
IBM PC mouse, 7 (1), 88
IBM PC/AT, 7 (12), 72; 7 (6), 88
IBM PCjr, 7 (2), 50
IBM Portable, 7 (11), 53
IBM Quietwriter, 8 (12), 75
ITT Xtra, 7 (10), 73
Kaypro 10, 7 (4), 68
Kaypro 2000, 8 (11), 90
Kaypro 286i, 8 (8), 47
Liberator, 8 (10), 60
Macintosh, 7 (3), 88
Magic, 8 (5), 78
NEC PC-8201, 7 (2), 74
Nimbus, 8 (3), 62
Octopus, 7 (2), 66
Okimate, 8 (5), 80
Olivetti M-21, 7 (11), 55
Olivetti M-24, 7 (5), 78
Omni-Reader, 8 (8), 57
One Per Desk, 8 (1), 83; 8 (4), 75
Optimem 1000, 7 (1), 80
PC-16, 7 (10), 73
Penman, 8 (9), 52
Philips Yes, 8 (11), 88
Pinnacle, 8 (1), 74
Quietwriter, 8 (12), 75
RML Nimbus, 8 (3), 62
RML 480Z, 7 (3), 100
Sanyo 775, 8 (3), 68
Seiko 8600, 7 (2), 70
Sharp MZ-700, 7 (11), 66
Sharp PC-5000, 7 (5), 94
Sharp PC-7000, 8 (12), 70
Sinclair QL, 7 (3), 104; 7 (9), 58
Sony Hit-Bit, 8 (2), 67
Sord IS-11, 7 (6), 104
Sprite, 8 (5), 70
Tandy 200, 8 (6), 60
Tandy 1000, 8 (4), 78
Tandy 2000, 7 (9), 73
TDI Pinnacle, 8 (1), 74
The One, 7 (12), 78
Timestep Satellite System, 8 (10), 82
Unitron 2200, 7 (3), 96
Vectra, 8 (12), 68
Vienna PC, 8 (8), 66
Wren, 7 (6), 101
Wyse PC, 8 (4), 80
Reviews — software,
Acornsoft Logo, 8 (3), 78
Amsoft, 8 (5), 86
APL for the QL, 8 (2), 74
BC Basic, 7 (6), 112
Bonnie Blue, 8 (11), 109
Brainstorm, 7 (7), 80
Caretaker, 8 (3), 84
Cash Value, 8 (10), 77
Commodore Programmers' Utilities Package, 7 (12), 87
Computer Concepts' Graphics ROM, 7 (5), 88
dBase II add-ons, 8 (4), 88
dBase III, 7 (11), 72
Delta, 7 (4), 50
Entrepreneur, 8 (1), 110
Expert-Ease, 7 (3), 108
Factfinder, 8 (7), 73
Filevision, 8 (1), 104
Forecaster, 8 (9), 67
Framework, 8 (2), 80
Friday, 7 (6), 110
Helix, 8 (6), 82
Hulk, 7 (3), 108
Jane, 7 (7), 72
Jazz, 8 (9), 54
LCSI Logo, 8 (3), 76
Lightyear, 8 (7), 69
Lotus 1-2-3, 7 (1), 70
Lotus Jazz, 8 (9), 54
LSL Logo, 8 (3), 76
Magic Spell, 7 (1), 90
Microsoft Word 2.0, 8 (9), 57
Microspell, 7 (1), 94
Microtext, 8 (9), 64
Miditrack, 7 (11), 70
Music Works, 8 (8), 70
Open Access 7 (7), 76; 7 (9), 76
Options, 8 (6), 72
Organmaster, 7 (11), 70
OS-9, 7 (9), 80
Oz, 7 (3), 106
Perfect Writer II, 8 (6), 74
Prodos, 7 (7), 70
Professional Composer, 8 (8), 70
Rescue, 7 (4), 50
Sales Edge, 7 (5), 47
Samna Word III, 8 (10), 70
Sensible Speller, 7 (1), 90
Simons Basic, 7 (6), 112
Spellguard, 7 (1), 90
Sycero, 8 (1), 78
Symphony, 8 (2), 76
The Last One Plus, 8 (10), 79
The Music System, 8 (9), 60
The Priority System, 8 (11), 101
Thoughtware, 8 (6), 80
Ticktack, 8 (7), 67
Tomorrow's Office, 7 (4), 50
Toolkit, 8 (3), 84
Trigger, 8 (7), 74
Turbo Pascal 3.0, 8 (11), 94
Visi On, 7 (2), 78
Vizastar, 8 (1), 106
Windows, 8 (11), 104
Word Perfect 4.0, 8 (8), 68
WordStar 2000, 8 (4), 84
Wordwise Plus, 8 (7), 71
Xchange, 7 (9), 93
RISC, Chip-Chat, 8 (12), 37
RML Nimbus, review, 8 (3), 62
RML Chain, 8 (2), 86
RML 480Z, review, 7 (3), 100
Robots, special feature, 7 (7), 116

S

S-100 bus micros, Top 100, 7 (12), 136
Sales Edge, 7 (5), 47
Samna Word III, review, 8 (10), 70
Sanyo 775, review, 8 (3), 68
Satellites, affordable links to, 8 (10), 83
Scheduling, Open File, 8 (3), 112
Screen layouts, Software Workshop, 7 (10), 51
Scribe, 7 (6), 115
Searching for a text file, Software Workshop, 8 (10), 31
Seiko 8600, review, 7 (2), 70
Selling techniques, 7 (5) 47
Sensible Speller, review, 7 (1), 90
Sharp,
PC-5000, review, 7 (5), 94
PC-7000, review, 8 (12), 70
Shell sort, Software Workshop, 7 (7), 45
Shops, use of computers in, 8 (7), 133
Simons Basic, review, 7 (6), 112
Sinclair,
Chip-Chat, 8 (1), 49
QL, book reviews, 8 (1), 167
news, 7 (6), 21
reviews, 7 (3), 104; 7 (9), 58
Spectrum, 7 (5) 112; book reviews, 7 (7), 173
Small Computer Systems Interface, 8 (5), 94
Software industry, British, Editorial, 8 (7), 5
Software, bundled with hardware, Last Word, 8 (2), 149
Sord IS-11, review, 7 (6), 104
Sorting, Software Workshop, 8 (2), 53; 8 (11), 55; 8 (12), 31
Soundex, Software Workshop, 8 (5), 45
Source, The, Comms Link, 8 (5), 43
Space-saving techniques, Software Workshop, 8 (4), 43
Special features,
artificial intelligence, 7 (10), 115
business graphics, 8 (9), 81
chips, 7 (2), 102
communications, 8 (12), 101
education, 8 (2), 99
Hot 100, 7 (12), 109
IBM PC and compatibles, 8 (6), 96
IBM PC, 7 (6), 67
inputs, 7 (9), 99
integrated software, 7 (5), 125
mass storage, 8 (10), 100
money programs, 8 (5), 109
networks, 8 (7), 88
operating systems, 7 (4), 100
power software, 8 (11), 121
printers, 7 (11), 101; 8 (8), 85
public networks, 8 (3), 91
robots, 7 (7), 116
speed, 7 (1), 101
word processing, 7 (3), 51; 8 (4), 103
specialised systems, Top 100, 7 (12), 142
Spectravideo 328, review, 7 (6), 106
Speech input, 7 (9), 100
Speed, special feature, 7 (1), 101
Spellguard, review, 7 (1), 90
Sprite, review, 8 (5), 70

index 84/85

Stock control, Open File, 8 (11), 137
Sugar, Alan, interview, 8 (12), 91
Summer recess, Editorial, 8 (2), 5
Supercalc, book reviews, 8 (5), 53
Sycéro, review, 8 (1), 78
Symphony, review, 8 (2), 76

T

Tables,
  hashed, Software Workshop, 7 (5), 35
  searching, Software Workshop, 8 (3), 57
Tandy,
  200, review, 8 (6), 60
  1000, review, 8 (4), 78
  2000, review, 7 (9), 73
Tava,
  Frontier Flyer, review, 8 (7), 62
  PC, 7 (6), 74
TDI Pinnacle, review, 8 (1), 74
Teaching programming, Last Word, 8 (5), 149
Telecom Gold, 8 (3), 94
Telesoftware, 7 (4), 81; 7 (5), 102; 7 (6), 132
Teletext, 7 (5), 102
Television, 7 (5), 102
Text strings, Chip-Chat, 7 (3), 35
The Gnome at Home, Comms Link, 8 (11), 61
The Last One Plus, review, 8 (10), 79
The Music System, review, 8 (9), 60
The One, review, 7 (12), 78
The Priority System, review, 8 (11), 101
The Source, Comms Link, 8 (2), 59; 8 (12), 109
The Times Network for Schools, Comms Link, 8 (2), 59
Thinkjet, 7 (11), 112
Thoughtware, review, 8 (6), 80
Ticktack, review, 8 (7), 67
Timestep Satellite System, review, 8 (10), 82
Tomorrow's Office, review, 7 (4), 50
Toolkit, review, 8 (3), 84
Tops 10s/20s/100s,
  16-bit machines, 7 (4, supplement)
  68000-based micros, 7 (12), 135
  battery portables, 7 (3), 127; 8 (4), 99
  British micros, 7 (11, supplement)
  budget business machines, 7 (6), 125
  budget systems, 8 (5), 105
  business packages, 8 (6), 91
  eight/16-bit micros, 7 (12), 127
  eight-bit desk-tops, 7 (12), 126
  eight-bit micros, 7 (12), 125
  expandable systems, 7 (7), 109
  home/serious micros, 7 (12), 14
  IBM compatibles, 8 (7), 81
  IBMulators, desk-top, 7 (12), 133
  IBMulators, transportable, 7 (12), 128
  integrated software, 8 (10), 93
  lap portables, 7 (12), 119
  MS-DOS micros, 7 (12), 134
  multi-user systems, 7 (12), 141; 8 (11), 115
  non-IBMulators, 8 (8), 77
  pocketables, 7 (12), 118; 7 (2), 99
  portables, 7 (12), 120
  printers, 8 (12), 97
  S-100 bus micros, 7 (12), 136
  specialised systems, 7 (12), 142
  transportables, 7 (4) 123; 8 (9), 77
Torch
  Graduate, review, 7 (12), 84
  Unicorn, 7 (12), 85
  Z-80, review, 7 (12), 81
Torchnet, 8 (2), 88
Tramiel, Jack,
  interview, 8 (4), 31
  news, 7 (10), 29
Transportables, Top 20, 7 (4), 123; Top 10, 8 (9), 77
Trendtext, 7 (3), 56
Trigger, review, 8 (7), 74
TTNS, Comms Link, 8 (2), 59
Turbo Pascal 3.0, review, 8 (11), 94
Turtle graphics, 17 (10), 97
Typesetting, 7 (11), 76

U

UMI-2B Midi Sequencer, review, 8 (9), 61
Unitron 2200, review, 7 (3), 96
Unix, 7 (4), 107, book reviews, 7 (12), 176
User-friendliness, Software Workshop, 7 (11), 47

V

Vectra, review, 8 (12), 68
Vicom 8 (2), 102
Video chips, 8 (4), 35
Vienna PC, review, 8 (8), 66
View, 7 (6), 114
Viewdata, 8 (3), 96
Visi On, review, 7 (2), 78
VisiCalc, book reviews, 8 (3), 137
  the next, Editorial, 8 (7), 5
Vision, 7 (10), 127
Vizastar, review, 8 (1), 106
VLSI, Chip-Chat, 8 (4), 35

W

Warnier approach to programming, Open File, 8 (6), 119; 8 (7), 107
Which Computer? Show, news, 8 (3), 29
Windows, Software Workshop, 8 (9), 35
  MS-DOS extension, review, 8 (11), 104
Word Perfect 4.0, review, 8 (8), 68
Word processing,
  BBC model B, 7 (6), 114
  book reviews, 8 (12), 58
  for authors and journalists, 8 (4), 103
  special features, 7 (3), 51; 8 (14), 103
Wordplus-PC, 7 (3), 58
WordStar, Software Workshop, 7 (9), 46
  2000, review, 8 (4), 84
  Open File, 8 (12), 125
  control-checker checker, Open File, 8 (11), 141
  double columns, Open File, 8 (1), 127
  proportional spacing, Open File, 8 (6), 116
  transferring files, Open File, 8 (12), 125
  Wordsworth, 7 (6), 116
  Wordwise, 7 (6), 115; 8 (4), 80
  Wordwise Plus, review, 8 (7), 71
  Work, Editorial, 7 (7), 5
  Wren, review, 7 (6), 101
  Wyse PC, review, 8 (4), 80

X

XCal, 7 (10), 97
Xcalibur Xmem, review, 7 (12), 83
Xchange, review, 7 (9), 93
Xerox, Company research, 7 (3), 130
  integrated software, 7 (5), 134

Y

Yamaha, YIS-503, review, 7 (4), 64

Z

Z-80, 7 (2), 107; 8 (5), 41
Z-8000, 7 (2), 113

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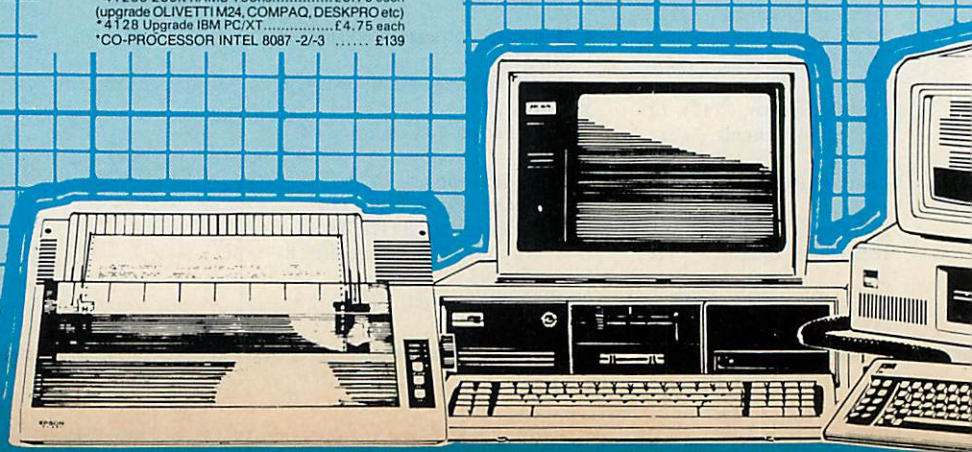

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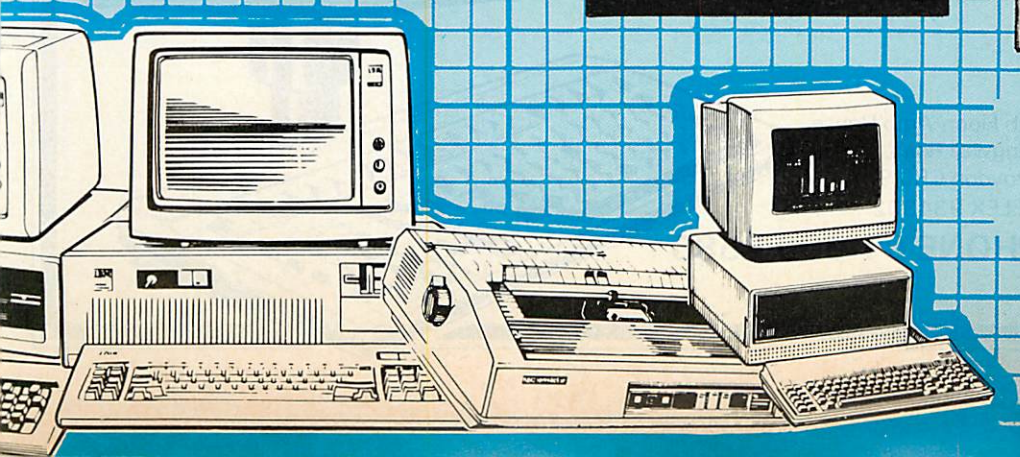

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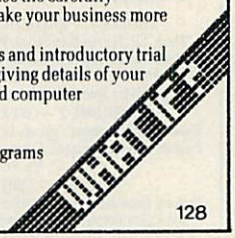

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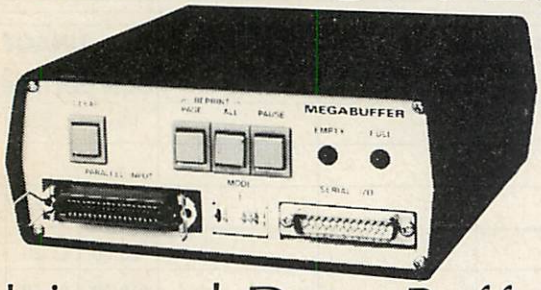

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